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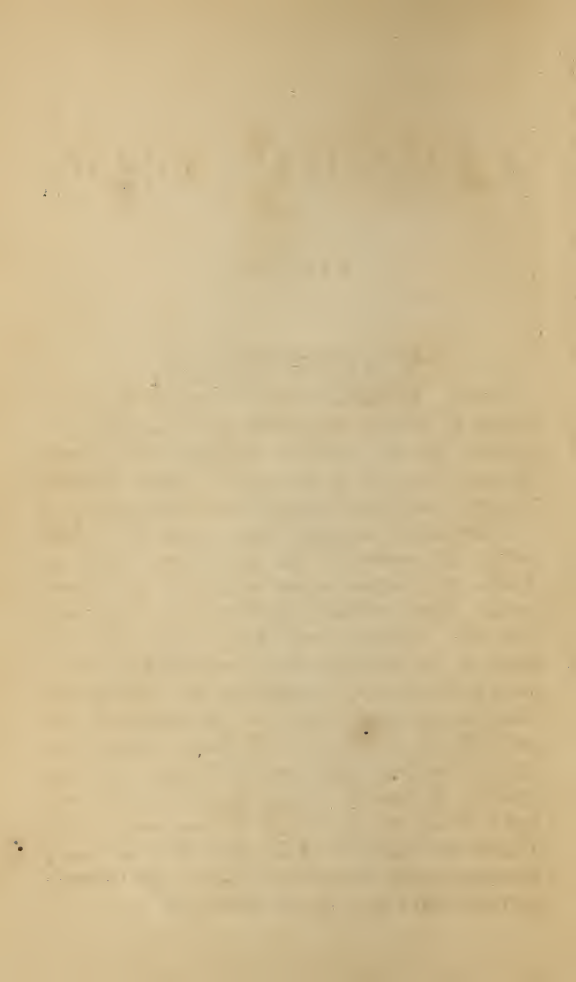


FRONTISPIECE.

A  
BOTANICAL LADDER  
FOR  
THE YOUNG.



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# A BOTANICAL LADDER

FOR THE

YOUNG.

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## CHAPTER I.

*Emily.* Mamma, when I gathered you a bunch of violets the other day, you said you should like me to know a little more about flowers than only to repeat their names, though I was too young to begin Botany.

*Mamma.* I thought your study of it had better be delayed till you knew more of Latin, and could pronounce aright the Greek words, from whence most of the terms are derived. But we will begin with the first steps of the ladder; for you know Charles is very fond of calling some of his studies by that name; and when he has worked one problem, he says it helps him on to the next, just as by degrees we ascend to the top of a ladder. A plant is a body that lives or grows, but cannot move at will, as you and I can. Plants are divided into two great classes; flowering and flowerless plants, or Phænogamous and Cryptogamic plants.

*E.* Oh, mamma, what hard words! I cannot remember them.

*M.* Well, never mind the hard words, only think of the two great divisions now. Run, fetch me a wild violet from the field, and we will talk about it. Oh, here is one on the sunny bank. Well, you see it has root, stem, and leaves; these are called its preservative organs. Now can you tell me anything else it has?

*E.* Yes, there is the bud, with its pretty dark-green leaves, and the purple flower peeping beneath.

*M.* Those pretty dark-green leaves, or rather points, are called the calyx, or cup; besides these, there are often other parts belonging to plants, such as hairs, thorns, and tendrils. Some of these are intended as defences against insects, or injuries from drought, wind, and rain. In many cases they secrete honey, resin, oil, gum, and various other juices.

*E.* Have all flowers a calyx?

*M.* The outer part of every complete flower bears the name of calyx: whatever may be its size, form, or colour, the general use of this organ is to defend the more delicate parts of the flower from injury. When in its unfolded state, the different leaves of which a calyx consists are called sepals, and it often takes its name from the number of these. Here is a primrose: can you tell me how the calyx is divided?

*E.* Oh, mamma, it is not divided at all : see, I have taken it off entire !

*M.* Well, then, it is monosepalous, that is, one-leaved ; in the poppy it is diasepalous,



Meadow Geranium. (a) Perfect flower. (b) Flower deprived of its corolla ; showing the stamens, anthers, and pistil. (c) The pistil and seed-vessel.

meaning two-leaved. Gather me that lily, and I will tell you its different parts. Here you may observe the calyx, or cup ; the corolla, or blossom ; the stamens, or chives ; the pistil, or points ; the pericarp, or seed-vessel ; the seed, or fruit ; the receptacle, or base. Some plants possess all these parts, others are deficient in some of them ; but the stamens and pistil are to be found in all ; and by these it was that Linnæus, who, you remember, is called the father of Botany, divided his classes, and arranged them into different families or genera.

*E.* When Charles and I were playing the other day at the ‘three kingdoms,’ he said he had thought of something, and that it was in the vegetable kingdom. When I asked him to describe it, he said it could crawl, though it had neither hands nor feet ; and I said it

was impossible it could be in the vegetable kingdom. Still he said it was there, and that it had moved half an inch that afternoon. It quite puzzled me ; and to help me out, he said, " Look at that basket of seeds the gardener has just put in the window ;" but even then I could not find it out, and just then papa came in and called him to his lessons.

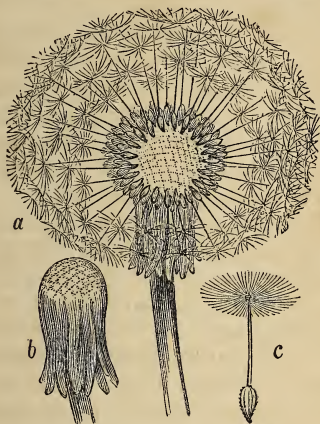
*M.* Your brother no doubt meant the animated oat. If one of these seeds be placed upon a shelf in changeable weather, it will after a day or so be found to have crawled forward to a considerable distance.

*E.* Crawled, mamma ! how can that be ?

*M.* When the seed becomes damp, it swells and lengthens ; when the air dries it again, it becomes shorter ; but on account of its stiff bristles, called setæ, such as you see in the ears of the common barley-grass, and also in an ear of wheat, it cannot return again to its first place ; so you see it is still true that, though it can crawl, it cannot move about as it pleases. Plants form the lowest link in the chain of life ; man the highest on our earth. I hope my little Emily will never reduce herself to a mere vegetable by sloth, nor by folly to a mere animal unblessed by reason—that noble faculty by which God has graciously distinguished man from the inferior creatures. The seeds of many plants have attached to them a feathery crown. When one finds a moist spot adapted to its growth, this crown falls



off. There is a dandelion: gather it, and let us observe how beautifully this crown, which is called a pappus, is supported upon the stalk. All these contrivances are intended to catch the wind, that the seed may be wafted



The Dandelion. (a) Part of a globe of seeds, or puff-ball; (b) receptacle turned outwards; (c) seed, with its carrier.

to a distance. Animals often assist in dispersing seed. It is well known that the seeds of numerous berries and small fruit will grow, though they have passed through the bodies of birds which have swallowed them. Thus we not only see the most wonderful contrivances in seeds for their dispersion, but the very habits of animals are made to subserve the general good.

*E.* Oh yes, dear mamma. Thank you for telling me all these nice things: and now will you come and see if the seeds in my little garden have come up? Oh dear, what can be the reason? not one of them is even peeping above ground!

*M.* You have most likely placed them too deep in the earth. They should never be put beyond the influence of the air. Perhaps, too, your seeds were too old for planting: they should be sown within a certain time after coming to maturity. The coffee-bean must be put into the ground within six weeks; while in some tribes of plants many years may elapse, and the seeds still possess the power of growing. This is the case with the seeds of cucumbers: indeed I have often heard John the gardener say he prefers such.

*E.* Do all plants die, mamma, when their seeds come to maturity?

*M.* This is sometimes the case; but though dead, their remains still tend to fertilize the soil. All plants, however, do not die when their seeds are once perfected; for the ages of plants vary as much as their forms. Where should we obtain our timber trees if they died immediately upon perfecting their seed? and what a privation should we suffer, if our fruit trees bore but once! God has graciously and abundantly provided for all our wants. Most of the vegetables we need, and the grains we use in food, are of quick growth; while our fruit and timber

trees remain for years, nay ages, increasing in beauty and usefulness. Oaks and chestnuts have been known to live a thousand years, and there are still growing trees which have existed for a much longer period. To make some amends for the loss of your seeds, at the proper season—which will be here at the end of May—I will ask old John to plant you out a few of the beautiful dahlias which he put in the hot-bed last February. You remember the roots he took up in the autumn. And now can you tell me what a root is?

*E.* A root, mamma, is a part of the plant which grows away from the light. But I do not know anything more about it.

*M.* The use of the root is to absorb moisture for the support of the rest of the plant, and generally to fix it to whatever it grows upon. A root is called terrestrial, if growing in the earth, as the generality of roots do; parasitic, if attached to other plants; aquatic, if suspended in the water: the latter kind of root does not fix the plant to any particular spot, not being itself attached to an immoveable substance. Roots differ from stems in not bearing regular buds upon them, and in growing downwards. They consist sometimes of fibres only, at others of variously shaped fleshy portions. Go to the green-house and bring me that beautiful pink hyacinth, and I will show you how each fibre terminates in a delicate white and spongy point called a spongiole. The spongioles, and

often the fibres which bear them, die away at the close of each growing season, being replaced by fresh ones when the plants revive. The pecu-



Spongioles,  
greatly magnified.

liar function of roots, to supply moisture to the rest of the vegetable, is shown by plants endeavouring to increase and extend their roots according to their wants. Such plants as grow on dry and hot sand, or on naked rocks, have usually very long and fibrous roots extending far below the surface, whence moisture is attainable. A tree disturbed from its place of growth and injured in the fibres of its roots, will

die unless it can immediately throw out others.

*E.* Oh yes, mamma, I know that, for I saw old John very carefully transplant some shrubs the other day; and he asked me not to play with my hoop so near them, for fear I should break off the fibres. I suppose he meant that, though he did not say that word.

*M.* See, there are papa and Charles coming over the field; run and meet them, and then you must go in and dress for dinner.

*E.* Oh, mamma, what do you think Charles says?—he has seen a real pitcher made of nothing but leaves! What can he mean?

Miss B. showed him the leaf and the pitcher dried in a book.

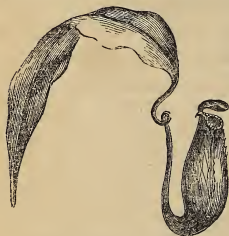
*M.* I am sorry you were not with your brother this morning ; but if you come to me this afternoon, after you have done your work, I will show you a very pretty drawing I have of this plant, and you may read a short account of it.

## CHAPTER II.

*Emily.* Now, mamma, will you show me the picture of the pitcher-plant, and let me read about it?

*Mamma.* Yes; here is the picture, and the account begins over leaf.

*E.* “The *Nepenthes distillatoria*, or pitcher-plant, is one of the most singular of nature’s wonders: it is furnished with appendages to the leaves, which are shaped and closed like pitchers, provided with a moveable lid. As soon as the pitcher becomes filled with water, either by rain or dew, the lid shuts down closely upon it. It is prevented



The Pitcher-plant.

from turning over by a hook attached to the top of it, at the back or point of the lid. When the pitcher becomes empty, its lid again opens to let in a fresh supply; and in this singular manner a store of limpid water is preserved. The plant grows in China and in the swamps of the East Indies, and is by no means rare of cultivation even in this country.” Not rare

of cultivation in this country ! How I should like to have one ! But here is another picture, and something about a cow-tree ; and it begins by saying, “ Let not this order be neglected because of its containing the stinging-nettle.” I thought stinging-nettles were never good for anything.

*M.* In that you were mistaken : the leaves of the nettle are used as a pot-herb ; its stalk forms a valuable cordage ; and its warm and nourishing seeds are often given to poultry. Many of the most common plants in structure belong to an interesting family or genus. We must not expect to find in them, any more than in persons, many perfections united. People who are rough in exterior and blunt in manner, are often possessed of good qualities.

*E.* Yes, mamma ; but one cannot help liking people better who are polite and kind, and who always look nice. I heard you say the other day to papa, you were sorry Miss D. called when Miss G. was here—they were such contrasts, and they would not understand each other.

*M.* Yes, I remember saying so, because Miss G.’s refinement of mind manifests itself in her dress, her manner—in short, in all that she does or says ; and Miss D., though a very worthy person, is too neglectful in all these particulars.

*E.* Shall you ever buy for me, mamma, the book my cousin Jane has ? It is all about how we ought to behave.



*M.* No : polite manners I should wish to proceed in my little Emily from real kindness of heart, and that is not to be learned by any such rules.

*E.* And now, mamma, will you tell me about the cow-tree ; for I never heard of such a tree before ?

*M.* It is a native of South America ; and I suppose takes its name from this circumstance, that if you pierce the trunk a sweet and nutritive milk flows forth, which is in greatest abundance at day-break : at this time blacks and other persons hasten from all quarters, furnished with large jugs to catch the milk, which thickens and turns yellow on the surface. Some drink it on the spot, others carry it home to their children. *M. de Humboldt*, who first discovered this tree, says it is tall, straight, and stately, growing on the sides of rocks ; its thick roots scarcely penetrating the stony soil, and not moistened, during many months of the year, by a drop of rain or dew. But dry and dead as the branches appear, you see it produces a very pleasant and nutritious liquid, which is another lesson to us neither to judge of persons nor things by merely outward appearances.

*E.* Mamma, the book says the far-famed poison-tree of Java is of this order. Is it true that birds flying over this tree are killed ? And are criminals sent as a punishment of death to collect a box of poison from it ?



*M.* No ; I believe such accounts are quite unfounded, and may be attributed to the monks, who first discovered the tree, and greatly exaggerated its poisonous effects. The upas poison is certainly deadly, but only when infused into a wound, or otherwise received into the system.

*E.* Can you, dear mamma, show me a picture of the cotton-tree ?



Cotton Pod.

*M.* Indeed I think you do not deserve I should, for your cotton has been left all the time you have been looking at these prints on the window-sill. Of this valuable production

there are several kinds more or less cultivated throughout the hotter parts of the world. The two principal are *Gossipium herbaceum*, for that is the Latin name, and *Gossipium arbo-reum*: the latter is a tree some 20 feet in height, common in the East; the former is a small annual plant of 18 or 20 inches high, cultivated and reaped, throughout the southern part of Europe, Asia Minor, and the southern states of North America, as corn is with us. In China there is another species, bearing a yellow flower or down, which is woven by the Chinese into nankeen. As I have now mentioned a tree, a shrub, and an herb, can you tell me the distinction between these?

*E.* Trees are those plants that bear flowers for several years in succession: they have a very thick and high trunk, and are divided at the top into branches.

*M.* Your definition of a tree is very good: now for one of a shrub.

*E.* Indeed, mamma, though I know what a shrub is, I know not how to describe the difference.

*M.* A shrub is a small tree, with a woody stem, which begins to be divided into branches near the ground. Herbs, or herbaceous plants, have soft and woody stems: if they bear leaves and seeds within one year, and then die, they are called Annuals; when they bear leaves in the first year, and flowers in the second, and then die, they are called Biennials; and if

they live and flower for more years than two, they are called Perennials.

Climate and cultivation have great effect upon all plants. The trees of a warm or temperate climate dwindle into shrubs in a cold one. A great many years ago, before the countries of Europe were cleared and cultivated, they appear to have been as cold in the midland parts as Lapland or Siberia now are, or even the dreary shores of Hudson's Bay. Thus we see the truth of the old adage, "Nothing, in our work-a-day world, is to be got for nothing;" but everything really valuable must be purchased by diligence, patience, and perseverance.

*E.* Oh, mamma, what is that curious-looking leaf?

*M.* That is the leaf of the papyrus, a large plant which grows wild in Egypt, among the stagnant waters of the Nile after its inundations. The Egyptians and Romans formerly used a part of this plant for the purposes we now do paper. It is from this plant that the paper of our day takes its name. They used the roots for firing, made little boats from its wood, and formed the inner bark into sails, mats, garments, and cordage. The juice they swallowed as a great dainty.

*E.* Well, mamma, though we cannot boast of such useful plants as the papyrus and cotton-tree, we have some beautiful flowers which I suppose they never had.

*M.* Indeed, Emily, we have nothing to boast of. Most of our beautiful garden flowers we owe to foreign climes. For those beautiful auriculas and tulips, which are, I believe, quite your delight, we are indebted to Asia; the pink and carnation come from Italy; and the delicate, fragrant jessamine is a native of the East Indies. As a general fact, it is admitted that a high temperature is the most favourable to vegetation. Yet each country, even each village, has its own peculiar flowers; and the plants of one situation are not those of another. Surely in this we may see the goodness of God. You heard your uncle say, that at the Cape of Good Hope beautiful varieties of the geranium nestle undisturbed on every bank, and climb unheeded over every thicket; yet the queen of flowers, the rose, is absent. Indeed, no rose greets the traveller's eye in any part of the southern hemisphere. From the Cape, however, we have brought more than three hundred species of heaths. When America was first discovered, which you know was in the year 1492, by Christopher Columbus, a number of plants and flowers were found there, till then unknown to the inhabitants of Europe, which have since been transported thither. From Brazil, a province of South America, we have the potato. The soil of each different country contains juices proper for the nourishment of the vegetables peculiar to it.

*E.* Will you, mamma, be so good as to explain to me the meaning of this long, hard word?

*M.* That word is Monodelphia: it is a Greek word, signifying brotherhood; but unless you will have patience and perseverance to commit to memory the first eleven classes, which describe the number of the stamens contained in each flower, I cannot undertake to explain to you all these words; for you must remember we are ascending a ladder, and must proceed step by step. Linnæus was scarcely four years old when he began to ask his father the names and properties of all the plants he could procure. As he grew older, he saw the necessity of order and arrangement; and according to the number, situation, and proportion of the stamens, he divided his classes into twenty-four in number. In the eleven first classes the number of the stamens alone is considered. I think you know what a stamen is; but in case you do not, gather me a fuchsia from the green-house. These slender crimson threads are called stamens: count them.

*E.* There are eight, mamma.

*M.* Well, then, you will soon know, by learning these, to which class it belongs. Not to burden your memory, I will tell you only the first eleven of these classes. These are, Monandria, plants with 1 stamen; Diandria, plants with 2; Triandria, with 3; Tetrandria, with 4; Pentandria, with 5; Hexandria, with

6; Heptandria, with 7; Octandria, with 8; to which your fuchsia belongs; Enneandria, with 9; Decandria, with 10; Dodecandria, with from 12 to 19.



*Fuchsia.*

## CHAPTER III.

*Emily.* Now, dear mamma, that the sun has done playing at bo-peep, and looks quite bright and steady, will you take a walk with us through that pretty lane where we saw the May the other day? And perhaps, as I know the first eleven classes, I can find some wild flowers to answer to them.

*Mamma.* We will go and see. Put on your bonnet, and call Charles.

*E.* Oh, there is that beautiful May! Charles, do gather me that branch. Oh dear! you cannot reach it for those tiresome thorns.

*M.* Those tiresome thorns, as you call them, are very useful as a defence against animals which might otherwise do mischief. Some of the trees, thus armed whilst growing within reach of the deer and other animals, become spineless when they have reached a greater height.

*E.* Do hips and haws grow on the same tree?

*M.* No; the haws are from the May which you hold in your hand, and hips are the fleshy red fruit of the dog-rose. People generally think it will be a severe winter when there are



plenty of these, as they supply food for the little songsters of the woods ; but I believe there is no other foundation for this opinion.

*E.* Can I get any dog-roses to-day ?

*M.* No, they will not be in bloom yet ; besides, they will trouble you sadly with thorns. To reconcile you to them, I will give you some pretty lines :—

“Why does the painful thorn presume  
To spoil the rose’s soft perfume ?  
It was by Providence intended  
Our pains and pleasures should be blended.  
We smile to-day, to-morrow mourn,  
Nor find a rose without a thorn.”

*E.* But, mamma, why should cares and pleasures be mixed—for I think that is what is meant by blended ? Why should not every day be a happy one ?

*M.* To answer that question, my little Emily has only to look into her own heart, and to recall our conversation yesterday.

*E.* Oh ! I remember ; when I threw down my Latin lesson, and said it was impossible to learn it, you said, unless I could learn to govern myself I should never be happy ; and after I threw down my book, my lesson was a great deal more difficult than before.

*M.* Yes ; and you forget the sad effects your influence had all that time.

*E.* I do not quite understand what influence means.

*M.* Influence is the power one mind has over another.



*E.* Oh, mamma, how can such a little girl as I am have any influence?

*M.* Do you remember when Charles brought me a violet the other day, I put it into my work-box, and you could not think what made my work smell so sweetly?

*E.* Yes; though I did not see it, I knew something very sweet was there.

*M.* Though not so powerful as the rose, the scent of the little modest violet is very fragrant. And cannot you learn something from this? Some influence you have, even now, over your little sister and brother; and it will increase, with your years, to all around you. Whether that influence be good or bad, must in no small measure depend on your care and diligence now.

*E.* Oh, mamma, I will try to govern myself; but sometimes it is very difficult.

*M.* At all times, my dear, if you attempt it in your own strength. We can only succeed as we look up to and trust in the Giver of all good. But look! there is your brother beckoning to you. Go and see what he wants.

*E.* He says, mamma, he will give me this pretty little white flower, root and all, and that it will bear fruit, if I will tell him to what class it belongs. I cannot find out, for it has so many stamens it quite puzzles me.

*M.* You have not yet learned that class: it is called Icosandria, and has twenty or more stamens placed on the calyx. All our roses, from

the wild brier to the splendid moss, belong to this class, and so do most of our fruit trees. In the class Polyandria, the stamens, many in number, are fixed upon the receptacle. That class contains many poisonous plants, and I will show you one when we go into the corn-fields. Now pull off the calyx, and see to which class it belongs.

*E.* All the stamens come off with this pretty little green cup, so it must be in the class Icosandria. I am glad it is not poisonous.

*M.* You will not find any poisonous plants in this class. The stone fruits indeed yield prussic acid, which gives that nice flavour to the kernels.

*E.* What! prussic acid, that put our dear little dog Guido out of his misery when the horse kicked him?

*M.* Yes, the same; but in the kernel it is never in sufficient quantity to prove hurtful. Indeed, when given in a proper proportion of water, it is very useful in allaying whooping-cough.

*E.* I think this little white flower must be the strawberry blossom.

*M.* Surely you have not forgotten your old favourite, with its delicate flower, and its pretty leaf divided into three parts. A month or so hence, and you will find it yielding a delicious red berry. It is said to be an excellent remedy for the gout, and that Linnæus himself was cured by it. I have read that the amiable St.

Pierre, when about to write a general history of nature, was dissuaded from his design by examining a strawberry plant which grew in his window. In this single plant he found so much to learn and to admire, that he desisted from his extensive plan, as beyond the powers of even the longest life ; and instead of it, produced his interesting work, the Studies of Nature. When we return, you shall read to me an animated description St. Pierre gives of the strawberry.

*E.* Is it not kind of Charles, mamma ? He has gathered me all these flowers to dissect, for he says he did not know I had learned that class. May I sit down on this bank, and try to find out what this pretty little blue flower can be—I mean in what class it is, for I know it is the forget-me-not ?

*M.* No ; you are mistaken. It is not the forget-me-not, but the speedwell. Now see how many stamens it has.

*E.* I have found out just two, so it must be in the class Dian-



Class 2nd, Diandria ;  
flower, Veronica or  
Speedwell.

*M.* You have not yet learned the orders, which depend on the number of pistils, or you would say, Order Monogynia ; for you see it has but one pistil, or style, as this little point is called. I will tell you the orders ; but you must promise to commit them to memory at some other time.

Monogynia, 1 pistil.	Heptagynia, 7 pistils.
Digynia, 2 pistils.	Octagynia, 8 pistils.
Trigynia, 3 pistils.	Enneagynia, 9 pistils.
Tetragynia, 4 pistils.	Decagynia, 10 pistils.
Pentagynia, 5 pistils.	Dodecagynia, 11 pistils.
Hexagynia, 6 pistils.	Polygynia, many pistils.

*E.* Oh, mamma, do not tell me any more hard names.

*M.* You are terribly afraid of hard names, Emily; and yet, as I have before told you, you cannot ascend the ladder without some difficulties. However, let us talk about this pretty little flower which you mistook for the forget-me-not. You see it is so fragile, it is already withering in your hand. I fear you will not be able to carry it home. These pretty flowers close at night, or before rain comes on, and open again when the shower is past. In the same class with this little plant we find the jessamine, lilac, rosemary, and privet. You remember the hedge you used so to admire by widow Brown's cottage, with its grape-like clusters of black round berries?

*E.* Yes; and she told me that bullfinches and blackbirds fed upon them, though they were not good things for young ladies to eat, for I wanted to taste one.

*M.* I hope you will never think of doing such a silly thing. If you are not tired, I will tell you of some other plants found in this class.

*E.* Mamma, I am not tired, and I think I can remember this nice talk, for there are no hard names.

*M.* Well, then, the olive is found in this class; and also the pepper plant, which is a native of the East and West Indies. The white pepper was formerly thought to be of a different species to the black; but it is nothing more than the ripe berries deprived of their skin by steeping them in water, after which they are dried in the sun. It is this berry, ground into powder, that you see at dinner. The olive is supposed to have come originally from Asia. It gave the name to the Mount of Olives, near Jerusalem. There is a species of olive found in the south of Europe, cultivated for the sake of its fruit, from which olive-oil is obtained by pressing it in a mill. Now we have talked long enough sitting on this shady bank, let us be walking; but remember that I have told you a very few of the plants found in this class. It will be an amusing as well as instructive exercise for you to look for others, and tell me all you can about their properties and uses.

*E.* Here is a daisy just beneath my feet. Cannot I find out to what class it belongs?

*M.* No; for it belongs to the class Syngenesia, and is a compound flower; that is, it is composed of a number of small flowers, all placed upon the same receptacle, and within one common calyx. You may dissect it, and I think I can tell you something about the daisy that may entertain you.

*E.* Oh, do.

*M.* This pretty little flower opens at sunrise, and closes at sunset. This curious property was known to belong to it many years ago, and is the origin of its name. It is one of the flowers which belong to Flora's clock.

*E.* Flora's clock, mamma! what can that mean?

*M.* Poets tell us of a fancied being called Flora, the goddess of flowers; and as some flowers open at certain hours in the morning, and close in the evening, they are figuratively called her clock. But the great Linnæus formed a real clock, by planting in a circle such plants as open and shut their flowers at certain times. Thus, for instance, the dande-



(a) Floret of the disc. (b) Floret of the ray.

lion opens at 5 in the morning, and closes at 8 in the evening; the yellow poppy opens at 5, and closes at 7; the field convolvulus opens at 5, and closes at 4; the white water-lily opens at 7, and closes at 5; the lettuce opens at 7, and closes at 10; the pimpernel opens at 8, and closes at 3; the red sand-wort opens at 9, and closes at 3.

*E.* Mamma, is not the pimpernel sometimes called the poor man's weather-glass?

*M.* Yes; and this little plant, as well as chick-weed, is a remarkable example of drooping the head and folding up the petals be

fore rain. The shape of other plants defends them from the injury of the weather. Thus, in a field of peas, every flower turns its back to a gale of wind. Use your observation, my dear little girl, and you may discover many of these things for yourself. The works of nature, or rather God's works in nature, resemble a beautiful cabinet; and industry, application, and observation, may serve as keys to unlock its various compartments. What have you got in your hand? Oh, I see: it is a piece of wood-sorrel: it opens with the rising sun, and closes only at his setting. And what do you think we may learn from all we have seen in our walk?

*E.* I cannot tell you just now, but I will try to put down in my common-place book what you have told me this evening; and may I now tell you such a pretty verse my cousin taught me the other day?—

“On every herb on which you tread  
Are written words, which, rightly read,  
Will lead you from earth's fragrant sod  
To hope, and holiness, and God.”

*M.* They are pretty lines, but by no means true. When you are a little older, I shall wish you, whenever you read or hear poetry, to write out the sentiment contained in it. Now there is nothing in the fragrant sod, or in the ever-varied wonders of the flowers and herbs that adorn it, to lead the mind to



holiness and God. Oh no, my dear little girl ; do not mistake : our Saviour himself said, "Ye must be born again;" and we can only be made holy by the Spirit of God. No stream can rise higher than its fountain, as you heard your papa explaining to your brother the other day. No earthly objects, therefore, however they may excite our wonder and delight, can lead the heart to God. The influence must be Divine. If you do not understand these things now, let that be no reason for inducing you to be careless and negligent in using the means of grace. Remember our Saviour's injunction, "Search the Scriptures." Never suffer any day to pass without taking them as a lamp to your feet and a light to your path.

*E.* Oh, dear mamma, you make me almost afraid I shall never be what you wish me—a Christian, a disciple or follower of Christ. To be one seems so very difficult.

*M.* Do not be discouraged : let the feeling of your own weakness and your daily faults in temper and conduct lead you to ask sincerely and earnestly for the grace you need. That grace our blessed Saviour died to purchase, and promised to bestow by the influence of his Holy Spirit. We have reached the hall door, and must leave this subject for the present.



## CHAPTER IV.

*Emily.* Oh, do come to the window, mamma, and look at this beautiful rainbow ! What makes all those beautiful colours ?

*Mamma.* The rays of the sun, more or less broken in the drops of rain, and reflected to our eyes.

*E.* I cannot quite understand it.

*M.* My dear little girl, the subject is very difficult to make clear to your understanding at present ; I will, however, endeavour to explain it to you ; and first tell me, how do objects become visible to you ; that is, how do you think you see them ?

*E.* I suppose I see them by the light.

*M.* Yes ; the particles of light flowing from objects pass through the external part of your eye, and are collected upon a bundle or network of nerves, at the bottom of the eye, called the retina, and there form the images of the objects from whence they proceed, and which you see.

*E.* Thank you, mamma ; I think I understand it a little better.

*M.* Do you know why Charles's large ball rebounds, or bounds back, when thrown

against the garden wall? Just in the same way do the air and other natural objects reflect or throw back the rays of light. These rays, you know, (if you have noticed,) move in straight lines while there is nothing to refract or turn them out of their way; but when they meet with drops of water, they are broken and reflected to our eyes in the beautiful colours you see.

*E.* Oh dear, I do not quite understand it yet.

*M.* When you are a little older, you shall read some interesting essays on this subject by those who have made light and colours their study.

*E.* I cannot tell the number of colours in the rainbow, though I have been looking at them all this time.

*M.* I am not surprised at that. Do you remember the pretty lines I read to your brother the other day?

“What skilful artist e’er would choose  
To paint the rainbow’s varying hues;  
Unless to mortal it were given  
To dip his brush in dyes of heaven!”

*E.* I do not wish to paint the rainbow, but I should like to know the colours that are in it.

*M.* I will tell you them. They are violet, indigo, blue, green, yellow, orange, and red; and from these seven primary colours proceed the vast variety of hues that so delight us,

and which ought continually to remind us of the tender goodness of our Heavenly Father.

*E.* But, mamma, I want to know what makes that rose pink, the convolvulus blue, and that bright poppy scarlet?

*M.* That is a difficult matter to make clear to your comprehension, with the slender stock of information you at present possess. Bodies reflect chiefly the rays of that colour which distinguishes them, and absorb or swallow up the rest. The scarlet poppy reflects only a mixture of red and orange-coloured rays. The beautiful white lily by it reflects all the colours, or rather I should say the rays of all the seven primary colours I have mentioned to you, for white is a mixture of all of them together.

*E.* Pray, mamma, what makes black; I mean, what makes things appear black?

*M.* Substances that appear black absorb instead of reflecting the rays that fall upon them; that is, the rays of light are lost within them, and not returned to the eye.

*E.* Thank you, dear mamma; I do understand a little more about it.

*M.* When you are more advanced in other knowledge, I will show you some curious experiments, which have led intelligent men to entertain the opinion I have just given you; for you know all mere opinion on such subjects is worth nothing unless founded on tried facts.

*E.* Cannot you show me any now, mamma?

*M.* No, not to-night ; it is too late. But I will tell you that one thing which has led wise men to think as they have done, is, that the green colour has been extracted from grass and the leaves of plants ; and red, purple, and blue, from flowers. Ascend your ladder gradually, and as you advance wider prospects of wonder and delight will open to your view ; but of one thing I must remind my little Emily, never to neglect the all-important world within for the wonders and beauties of the world without.

*E.* I do not quite understand you, mamma.

*M.* I mean, my dear child, that without the renewing of the Holy Spirit, and constant watchfulness and prayer, the weeds of selfishness, pride, and folly will spring up. These are the natural products of the heart ; and they will, but for the grace of God, display their poisonous effects in your conduct. But it is more than time for you to put your work-box away, and retire to rest.

*E.* I will ; only I should like to wait till the lamp is brought in. I want to see the pretty crocuses in the glass dish, that are now all closed, open underneath its warm and pleasant light.

*M.* On condition that you tell me to what class the crocus belongs, I will grant your request.

*E.* Let me see : it has three stamens and one pistil ; then it must be in the class Triandria and order Monogynia.

*M.* Quite right. I dare say you have heard your aunt speak of Saffron Walden, where your cousin George goes to school. I will tell you why it has this name. The summits of the pistil of the *Crocus sativus*, or autumnal crocus, are carefully picked, pressed together, and dried in a kiln; and are then the saffron which



Saffron Crocus.

is sold in shops, and which was formerly very much used in medicine. From the quantity of this plant cultivated near Saffron Walden, that place has its name. In the same class you will find almost all the grass tribe. The

grasses that grow wild in this country are about one hundred and twenty species.

*E.* Dear mamma, shall I be able to collect an example of each?

*M.* Indeed I fear you will not, for they are very difficult for a grown person to distinguish, much more a little girl, and so young a botanist. You may select a flower in each class, (I mean the eleven you have learned,) the best adapted for drying, and thus form the commencement of an Herbarium. But it will not answer to pick off the top of the flower, as I saw you do the other day. A good specimen should have every part of a plant: its root, stem, and leaves; its flowers past, open, and in bud; and its seed and seed-vessel in their different states.

*E.* How can I gather them all together; for you know I shall not find the seed-vessel till the flower has passed away?

*M.* Very true; but each part of the plant must be procured at the right time, and be placed by the side of the other afterwards.

*E.* Now I understand, and I should like to begin to-morrow; but must I not have some blotting paper, as my cousins have?

*M.* Some persons consider blotting paper the best, but any paper will answer the purpose; brown paper will do as well as any other. Having dried your specimen, wash over a sheet of paper with thick gum-water, and when it is perfectly dry cut it into various strips, which will form bands to fasten on your specimen

with. Nothing now remains but to write at the top of your plant its class and order; your brother will write you the Latin name at the bottom, and you may put its English name by the side of it. You must remember to place something weighty upon the book in which you dry your specimens, and change them from one leaf to another every two or three days whilst they are drying. See! the crocuses have opened their bright yellow petals to the lamp, and that is your signal to depart. If you do not go to rest with the linnet, you cannot rise with the lark.

*E.* Only one minute, mamma, just to put my box away. I wonder what wood it is made of, it is so bright and pretty.

*M.* The wood of the holly, I make no doubt, as a great deal of the Tunbridge ware is made of it. It is remarkably white, and takes a fine



Class the 3rd ; Triandria.



Class the 4th ; Tetrandria.

polish : it is in the class Tetrandria, and order Tetragynia. Now can you tell me how many stamens it has?

*E.* It must be in the 4th class and have four

stamens ; but that hard word, the order, I do not know.

*M.* Tetragynia means, having four pistils. To-morrow we will gather a piece from the garden, and examine it. Many other plants, useful in various ways, belong to this class : here is an illustration—the dog-wood, or *Cornus* : you will, I hope, acquire a knowledge of them by degrees. Now run away, Emily : remember,

“ Early to bed and early to rise,  
Is the way to be healthy, wealthy, and wise.”



## CHAPTER V.

*Emily.* Good morning, dear mamma ! Oh, I am glad to see the nice warm arrow-root all ready for us. Did you not say arrow-root came from South America ? and something else you told me about it, which I have forgotten.

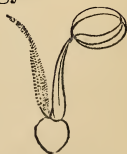
*Mamma.* I told you it has its English name from being supposed to extract the venom from wounds given by the Indians with their poisoned arrows.

*E.* What part of the plant do we eat, mamma ?

*M.* The root ; which, when pounded and bleached, makes the powder that we use as food. This plant has only one stamen. Can you tell me the class to which it belongs ?

*E.* It must belong to the class Monandria ; and the order, I suppose, is Monogynia.

*M.* You are quite right. Only three British plants belong to this class ; and you must ask your brother to procure you an example for your Herbarium, for you will not easily find one. Perhaps Charles might get you a piece of mare's-tail from the ditch by the side of the garden.



*Hippuris vulgaris.*  
Class the 1st ;  
Monandria.

It has its

flowers and leaves in whorls, eight or ten together. It is not very commonly found, but he may try for you.

*E.* May I not go with Charles to get some?



Fertile Spike. Barren Spike.  
Mare's-tail.

You know it is very pleasant to surmount difficulties. That is the word Charles is so fond of using, and he says it means to overcome them.

*M.* You will meet with many in your present pursuit, so you may willingly relinquish this honour to your brother, and go with me into the green-house.

*E.* How sweet the geraniums smell! and

how beautiful they look, with that soft down all by the side of the stem !

*M.* It is indeed beautiful ; and the more minutely we examine each part of a plant, the more we shall see to excite our admiration and delight. Hairs are found upon every part of a plant except such parts as grow under ground. If the hairs are very short and thickly spread, the plant is said to be tomentose, or downy ; if longer, it is called pilose, or hairy ; if very long and soft, the surface upon which they grow is said to be villous. Plants are furnished with other appendages closely resembling hairs, such as scales and glands. The ice-plant derives its name from the number of shining wart-like glands covering its surface, and resembling so many specks of ice.

*E.* It is one of my favourites ; and do look, mamma, at this beautiful moss-rose by the side of it, reminding one of summer and winter !

*M.* That moss, which adds so much to the richness and elegance of the rose, is but a collection of glands.

*E.* The smell—oh, mamma ! the scent of this rose is delicious !

*M.* The perfume of all flowers arises from porous glands.

*E.* It often puzzles me, when I smell the flowers, to tell from what part the scent comes.

*M.* The smell of a body is part of the body itself, and is produced by very minute particles which escape from it.

*E.* But when I smell a flower, I do not see anything that comes from it, not even a vapour; and I can smell it a great way off.

*M.* You could no more smell a flower than you could taste a fruit, if the odoriferous particles did not touch your nose in the same manner as the nice flavour of the fruit comes in contact with your tongue.

*E.* Dear, how very strange! Then are the particles too small for me to see them?

*M.* Yes. There are many things in nature too minute for the eye of man to discern. When you stung your hand with the nettle the other day, you could not perceive the irritating poison which occasioned you so much pain.

*E.* Poison!—was it poison that gave me that throbbing pain?

*M.* Yes; the hair-like glands of the stinging-nettle are loaded with an irritating poison; and, besides this, it has points so sharp that the slightest touch penetrates the skin.



Sting of Nettle.

*E.* I am very glad this plant is not like the stinging nettle. But look, mamma, how it shrinks and curls up when I touch it, as though it were afraid of me!

*M.* It is a new plant your papa purchased yesterday, and I brought you to the green-house on purpose to surprise you with it. It is called the sensitive plant, and is a native of Brazil.

The effect is but trifling in this country, compared with that which takes place in its native woods: it there seems to recoil at the tread of the hunter, and it grows to ten times the size it does in this country. And what do you think of a plant that actually catches flies?

*E.* Oh, mamma, is that really true?

*M.* A plant I saw at the Botanical Garden at Chelsea, called Venus's fly-trap, has attached to its leaves curious appendages shaped



Trap-leaf of *Dionæa*. (Venus's Fly-trap.)

like butterflies with expanded wings. As soon as a fly settles upon one of these parts, the hairs with which it is furnished close round

the poor little insect, and prevent its escape ; the two wings move towards each other, and crush it to death.

*E.* I should like to go to the gardens at Chelsea ; and above all, I should like to see some of those curiosities that sir Hans Sloane collected.

*M.* I will indulge you some day by taking you to the British Museum, where many of them are preserved. His catalogue contained a description of 69,352 curiosities ; a treasure which he said was intended to magnify God and benefit man. The Botanical Garden your brother told you so much about, was left by sir Hans Sloane to the Company of Apothecaries, on condition of their introducing fifty new plants every year, till their number should amount to 2000.

*E.* What a very wise and kind man he must have been !

*M.* He was indeed both, and it was a blessing to mankind that his life was extended to an unusually long period ; he died in his 93rd year : he was first physician to George II.

*E.* Coming out of the green-house, I put my foot on this beautiful little flower. See how it is striped with pink, just like some of the shells in my cabinet.

*M.* It is the bindweed ; and the variety of convolvuluses in the garden all owe their origin to this humble little flower. Gather it ; and see if you can discover to what class it belongs

*E.* By standing out of the sun and dissecting it very carefully, I find it has five stamens. I was obliged to take my little pen-knife, for it will not bear rough handling. Let me think!—five stamens and one pistil; Pentandria, Monogynia. Am I right?

*M.* Yes; but an easier flower for you to examine would have been the great bindweed: it is a large, bell-shaped flower, with pure white blossoms. You will find a great many of them hanging most gracefully over the hedge that leads to Dove Dale. The flower of the common celery also furnishes a good specimen.

*E.* Can I find them to-day, mamma?

*M.* No: I think they are not in flower yet. I was forgetting they do not bloom till towards autumn. You will find an interesting example of this class and order in the currants and gooseberries which are just now in blossom.

*E.* What pretty little yellowish flowers! They have five petals. Ah! here, too, are the five stamens, which, as well as the petals, are fixed to the calyx. Is not this part the calyx, and are not these five little leaves called the petals?

*M.* Yes; they form the corolla, or flower. The corollas of many flowers are formed of one petal, like the Canterbury bell: it is



Flower of the common Celery. Class 5; Pentandria.



then called monopetalous; but those that have more petals than one are termed polypetalous.

*E.* I was just thinking how delicious these cooling currants and strawberries must be in very hot countries.

*M.* No thin-skinned fruits, such as currants, cherries, strawberries, plums, apricots and peaches, nor even common apples and pears, ever come to perfection in very hot climates. Each country has its peculiar fruits, wisely and graciously adapted to the wants of its inhabitants. Tropical fruits, though far more luscious than any we have here, are thought by many to be very inferior in grateful flavour. The islands in the South Seas have the bread-fruit, the banana, and papaw tree. China is supposed to have been the original country of the sugar-cane, the rice, and the orange.

*E.* Indeed, mamma! I saw some oranges in Mrs. B.'s green-house, and she said some of them were very nice to eat.

*M.* I did not tell you, my love, that they would not grow anywhere but in their native soil. By the industry of man, one country is made to contribute to the benefit of another. The gardener, by a mixture of the different sorts of earth, prepares a soil proper for the nourishment of the plant he wishes to foster, and regulates the heat according to that which nature has made necessary for it.



*E.* Thank you, dear mamma ; but I do not quite understand how so many different flowers can grow out of one bed. I thought the juices that were fit for one flower, would not do for another : I mean, from what you have said just now I should think so, for I never thought about it before.

*M.* Every plant is capable of choosing for itself, since it is provided with a set of vessels, or fibres, that admit those juices that are proper for its nurture, and reject all others. These juices circulate through the plant, as the blood does through our veins.

*E.* I should like to learn to paint flowers.

*M.* I would rather you should succeed in dissecting and drying them first.

*E.* Why, mamma ?

*M.* Because I fear by taking too many things in hand you will do nothing well ; and fancying you do will nourish that noxious weed, vanity.

*E.* Is vanity such a very bad thing ? Charles says, if Tom Brown were not a vain boy he would never get good marks for all his exercises, for he is not clever or industrious ; but when he takes up his slate and has no fault found with his exercise, he struts down the school-room just like a pouting pigeon.

*M.* Stop, stop ! I cannot allow you to tell me any more. I am sorry Charles should indulge so censorious and unamiable a spirit.

*E.* He does not mean to be unamiable, mamma ; he only laughs at it.

*M.* The sins of our fellow creatures, my dear child, are of too serious a nature to excite laughter in any considerate mind.

*E.* But do people think vanity is a sin ?

*M.* What does your directory say ? You have only to refer to that, independent of all people's opinions. Our Saviour's words were—"How can ye believe, which receive honour one of another, and seek not the honour that cometh from God only ?" John v. 44. And do you not often tell me that the chief end of man is to glorify God, and enjoy him for ever ? Now do not repeat these words with no more reflection than a parrot, but examine the motives of your actions, and see how far they are sanctioned or condemned by the word of God. You are not your own. You must have a higher aim in life than merely to indulge your natural inclinations. Will this pursuit tend to the glory of God and the good of my fellow creatures ? must be your first inquiry.

*E.* Dear mamma, I never thought of that before ; I always thought, when I was not at my lessons, that my time was my own, to do what I liked.

*M.* It is a very solemn thought, my love, that we are none of us our own ; and our salvation has been purchased at a costly price indeed ! This truth is not sufficiently considered. Let it be your endeavour, then, to

pass no day without bringing it to your recollection. But you must now go to your lessons ; and as I have some letters to write, we shall not meet till after dinner. Farewell, love ! Think of what has passed.

*E.* Yes, dear mamma, that I will. Good bye !

## CHAPTER VI.

*Emily.* Flowers of all colours, from the garden, and the green-house too ! Thank you, dear mamma !

*Mamma.* I know your love of arranging flowers, and thought you would like to replenish the vases.

*E.* Oh dear, I wish Charles would not leave the door open ! See how the wind has scattered all my Guelder roses !

*M.* It is a bad habit ; but you might have remedied the evil without talking about it. Shut the door, and pick up your treasures. See, here is

——“the laburnum, rich in streaming gold ;  
Syringa, ivory pure ; the scented and the scentless rose !”

*E.* Ah, the scentless rose ! but how beautiful it is, with its white, silvery globes ! light, indeed, as the foamy surf, to my sorrow I find them, for the wind has nearly scattered them all. What is wind, mamma ?

*M.* Air put in motion, which is caused principally by heat.

*E.* What is air ? I mean, what is air made of ?

*M.* Air is that transparent fluid with which

we are surrounded, and in which we breathe and move. Thus I have answered your first question. Your second is a more difficult one to make clear to you; and all I shall tell you about it at present is, that the atmosphere is the common receptacle of all the vapours arising from different bodies. One of its elements is carbonic acid gas. As you are acquiring the first elements of botany, I must tell you that carbon forms nearly the whole of the solid basis of all vegetables, from the oak to the most delicate flower. This gas is very injurious to animal life, and is one reason why the effluvia of plants are injurious to persons of delicate constitution, and particularly so at night; and because of this, I object to your taking flowers into your sleeping-room. It is worthy of remark, that the air emitted from the leaves is never hurtful; that which is injurious proceeds from the corollas only. When you are better acquainted with subjects more within the compass of your understanding, you shall read some interesting work on chemistry.

*E.* I shall like to do so very much, mamma. How pretty this lilac is! I have been trying to dissect a piece, but I cannot tell in which class it is.

*M.* It has but two stamens, so you know it must be in the class Diandria. The jasmine is in the same class, and rosemary too. Do you remember how your favourite poet describes the lilac?

*E.* Oh yes ; those pretty lines—

“The lilac, various in array : now white,  
Now sanguine, and her beauteous head now set  
With purple spikes pyramidal : as if,  
Studious of ornament, yet unresolv’d  
Which hue she most approved, she chose them all.”

Since I have been saying those lines, that little bee has been so busy flying about that narcissus. I suppose he is looking for honey. Where do bees get the honey from?

*M.* There are often found attached to the corolla, or situated near it, variously-shaped coloured parts : these are the nectaries, parts so called because of the honey which they secrete.

*E.* Have all flowers nectaries?

*M.* No ; not even all those which secrete honey. The white nettle, for instance, the tube of which you often have found so sweet, has no particular organ to secrete honey in. Every part of a flower which is neither calyx, corolla, stamen, nor pointal, is classed under this general term. The use of the nectary is not only to secrete honey, but that the little insect fluttering about the flower may aid in distributing the pollen from the stamens to the stigma.

*E.* What is a stigma? I do not remember you ever telling me anything about that.

*M.* I have told you that the pistil is that part, you know, in the centre of the flower, always connected with the stalk, which bears

the flower up, and remains attached to it long after the rest is faded.

*E.* Oh yes, I know all about that.

*M.* Well, then, a perfect pistil consists of three parts : first, the germ, which is the lower part, and forms the seed-vessel ; upon this is a thread-like piece, called the style ; the summit of this is swollen out—this is the stigma. But you will understand it better, if you fetch that crocus and dissect it.

*E.* Oh yes ; here is the stigma. I see it. The part that used to be collected to make saffron.

*M.* The ovary, or germ, and the stigma, are never absent ; the style sometimes is, and then the top of the germ is called the stigma. Examine that poppy, and you will see what I mean. There is the top of the ovary, or germ, like the spokes of a wheel.

*E.* See, mamma, how busy that little creature has been all this time ! Now it has flown to that daffodil.

*M.* Yes, the bee is a fit emblem of industry—an intelligent reprover of all idle people.

*E.* I should like to be able to find the nectaries in flowers, when there are any, though I do not want to rob you, little bee ; so do not hum so piteously over my head.

*M.* The larkspur has for its nectary a spur ; in the globe-flower the nectaries are thread-like, and mixed with the stamens ; the stock is provided with four glands round each of the stamens, which serve for nectaries.

*E.* Only see how that little bee is loaded with yellow dust ! What part of a flower is it called ?

*M.* The pollen of plants is a most beautiful object for the microscope. We will at some future time examine some by it. We are accustomed to see pollen as a yellow powder, but it by no means always takes this colour.

*E.* Oh, no ; for in the tulip there is quite a black powder. Is not that pollen ?

*M.* It is ; but it has various shades : sometimes orange, and bright brown ; shades of blue, purple, scarlet, and flesh-colour are also frequent.

*E.* Is it ever green or white ?

*M.* Very seldom, I believe, if ever.

*E.* I should like to see some bees at work, mamma. I cannot think what they will do with all that yellow dust.

*M.* Should to-morrow morning prove fine, we will take a walk to Cely's cottage. Kind Lady B. made her a present of some glass hives, in order to induce strangers to visit her cottage, and purchase her honey. Now go prepare your lessons for the morrow, that we may set out early.

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*E.* "Good morrow, little busy bee !  
You are abroad betimes, I see."

*M.* Yes, the bee is at her work before you. Take your breakfast quickly, and then repeat your Latin lessons ; we shall enjoy a walk, this bright sunny morning, through glowing corn-fields and sweet shady lanes.



*E.* How fresh the air feels, and how sweet the earth smells !

*M.* Yes,

“ Here’s a beautiful earth and a beautiful sky,  
And to feel it God gives us a heart and an eye ;  
Nor leaves us untouch’d by the pleasures they yield,  
Like the birds of the air, or the beasts of the field.”

*E.* Whose pretty lines are these ?

*M.* The lines of an early and choice friend of yours, Miss Jane Taylor. You, as well as many other little girls, are much indebted to her, or the amusement and instruction she has afforded you in her ‘ Original Poems ’ and ‘ Hymns for Infant Minds.’

*E.* Stop, dear mamma ! May I gather some of this beautiful moss ?

*M.* You may, but it will wither in your warm hand before we reach home. On our return you may gather some, and we will examine it by the microscope. It is most elegantly formed ; having leaves, stems, roots, and capsules to hold the seeds.

*E.* You never told me about them : in what class shall I find them ?

*M.* I did not tell you about them, because they belonged to the twenty-fourth class, which you know you have not learned : I thought, too, the hard name might frighten you—Cryptogamia ; but I have no objection to tell you some interesting particulars. There are more than 400 different sorts of mosses, natives of our island.

That you have just gathered is called bog-moss. Mosses are capable



Bog-moss.

of growing in much colder climates than most other vegetables. Crantz, who travelled in Greenland, counted above twenty different species without moving from a rock where he was seated. The poor Laplanders find great comfort from their mosses: they form excellent beds of one species by cutting thick layers of it, one of which serves as mattress, the other as a coverlet.

*E.* Dear mamma, you are joking: you do not mean to say that they make a counterpane of moss, and have no better thing to sleep on?

*M.* Linnæus, I assure you, tells us that he often made use of such a bed when he was travelling in Lapland. And what do you think of a cradle being lined with bog-moss? The Lapland women make great use of a grey bog-moss, which is particularly soft; they wrap their infants up in it, without any other clothing, and place them in leathern cradles lined with it; and there the little babies sleep, as warm and as snug as your little brother in his crib.

*E.* Dear me ! it seems so very odd. I should like to take some home, and make Fanny's doll a cradle of it.

*M.* You may do so, if you please ; for though it may wither in your hand, a little water will revive it. After moss has been gathered, and kept in a dry state for some time, if put into water, every part will expand, and become apparently as fresh as when growing.

*E.* Only see, mamma ; just as I was going to gather some moss, I found these pretty cowslips.

*M.* Yes, you may say, with the poet Montgomery,

“Now in my walk, with sweet surprise,  
I see the first spring cowslip rise.”

If you pull one of the little tubes of the flower, and put it to your mouth, you will find it deliciously sweet ; and I suppose you know that a nice wine is made from this flower. Pull one to pieces, and try if you can find out to what class it belongs.

*E.* I cannot tell, because the sun comes in my eyes, and I cannot find the stamens.

*M.* It has five stamens and one pistil ; and, therefore, is in the class Pentandria, order Monogynia ; in the same as the primrose, pimpernel, bindweed, violet, heart's-ease, honeysuckle, ivy, and others.

*E.* See, mamma ; was it not kind of that little girl in the nankeen bonnet ? She asked

me if I should not like to have some of her blue-bottles, as she called them ; but I thought they were blue-bells.

*M.* Blue-bell, or hyacinth, is the proper name for them ; but many children, and others, call them blue-bottles, because the young seed-vessel is shaped like a decanter. This pretty little flower is found throughout Europe. Its root is a white bulb : it bears generally blue flowers, but now and then we find them white or pink. It is a different flower, you see, from the hare-bell, and found in a different class. On dissecting one, you will find it has six stamens, all of equal length, and one pistil or style. Can you tell me the class and order ?

*E.* The class must be Hexandria, and the order Monogynia.



Interior of the common  
Snow-drop.

Class 6 ; Hexandria.

*M.* Quite right. This class is noted for the number of beautiful plants it contains. Almost all the bulbous-rooted flowers are found here—your favourite lily of the valley, snowdrop, (gather one, and I will show you the stamens,) the star of Bethlehem, tulip, and others with which you will become acquainted by degrees.

## CHAPTER VII.

*Emily.* I am glad we have been to that pretty cottage. I am quite rested now. And how kind and cheerful Mrs. C. was ! and yet I have heard you say she is very poor ; and she told you her husband had been ill with the rheumatism all the winter.

*Mamma.* Yes ; but Mrs. C. is a true Christian ; though poor, she is not ignorant of that knowledge which maketh wise unto salvation. Few have read the word of God with more prayerful attention. And thus, amidst many trials, she can be cheerful, grateful, and patient. These qualities have a good effect on her children, and on all around her : wherever they are found, they will produce happiness, either in a palace or a cottage. Try the cultivation of them, my dear child, in the soil of your own heart ; but do not expect to rear them without faith, and prayer, and watchfulness. You will not, in our walk, find any wild flowers equal to those in the garden and greenhouse ; which may remind you, in your own case, that the native productions of the heart are all bad.

*E.* I cannot think how they (I mean the bees) make those little pellets I saw in the hive.

*M.* They collect the yellow dust of flowers on the hairs of their body, then brush themselves, and form the grains into the little pellets you saw : they swallow these, and in their stomachs they obtain the consistence of wax.

*E.* Dear me, how very curious ! But how do they get the honey ?

*M.* The honey is collected by a sort of trunk, which the bee has. A small part of this honey goes to support the bee, and the rest is preserved in a little bag, with which the stomach is provided, to be cast up and deposited afterwards in magazines, for the support of the rest of the hive.

*E.* They do not eat the wax, do they ?

*M.* With the wax they build their habitations, and seal up the honey in their cells. They mix it with honey, to make bee-bread for their children.

*E.* More wonderful still, mamma !

*M.* And what will you say, when I tell you that bees have a queen. This queen has guards to attend her, and subjects over whom she rules.

*E.* Do you really mean what you say, mamma ?

*M.* You need not ask me that question. I never tell you anything I do not mean. In every hive there are three sorts of bees ; the working bee, the drone, which is supposed to be

the male, and the queen, which is longer and more beautiful than the rest.

*E.* And do the bees love their queen, as we do ours?

*M.* You will not doubt that they do, when I tell you that a person once took a swarm of bees that had been hived the day before, and, having shaken them on the grass, separated the queen from the rest, clipped one of her wings, and kept her in a box.

*E.* I think it was very cruel. Do not you, mamma?

*M.* Yes, I think it was an unnecessary experiment. The poor bees flew in all parts in pursuit of their queen, with a piteous cry; and, when the box was opened, they flew round her, waiting till she should lead them to some place of safety. But the poor queen could not fly; and, rather than desert her, though pinched with hunger, they would not go away to seek for food. I am sure you will be sorry to hear, that after four days they all died of hunger. The poor queen would not take any food when away from the others, and she died, too, soon after them.

*E.* It is a very sad story: I do not like to think about it. Here we are at the corner of the lane; but I should like to return by the corn-field.

*M.* Well, then, we must make our way through a lonesome wood, and that will bring us out in that direction.



*E.* Is not this sorrel, mamma? I put a bit of the leaf to my mouth, and it has such a pleasant acid taste.

*M.* Yes; and have you remarked its curious drooping red flowers, borne in little bunches round the stem? This plant belongs to the class Hexandria. There is also another kind, called sheep's sorrel: I dare say you may find some of it in the wood. The leaves vary much in shape, and the whole plant in colour, as it is sometimes green, at others red. You are passing by at this moment another beautiful plant in the sixth class.

*E.* What, mamma; do you mean this large dock-leaf? I did not think it was worth looking at, except when any one was stung by a nettle.

*M.* Indeed it is a very beautiful plant, growing sometimes four or five feet high: there is the curled dock, the great water dock, and the fiddle dock: what you have just now passed, is the curled dock.

*E.* But the fiddle dock seems such a very odd name.

*M.* It has that name from the curious shape of the leaves, contracted on both sides something like a fiddle. Its Latin name, translated, is "the beautiful dock," a name it well merits from the elegance of the petals of its flowers; they are egg-shaped, and very deeply toothed, of a green colour, with a large spot of scarlet in the centre of each. The stamens are large



and yellow, adding to the brilliancy of the flower; the stem is light green, striped with red, each whorl of flowers attended by a single leaf.

*E.* I could not attend very well to what you were saying, for just as we came out of the wood I saw so many sheep run down the hill. Before we came up to them, they were lying so peacefully under the trees, and I wanted just to stroke one. I wish they were not such silly creatures as always to be afraid of one.

*M.* Indeed you are mistaken, they are by no means silly creatures; but for them to be thus familiar, you must live among them as in patriarchal times, when the daughters of princes and nobles are described as tending the sheep, and leading them out to water.

*E.* I should like that. I wish they would let me lead them.

*M.* Mr. Hartley, in his travels in Greece, says: "Passing a flock of sheep, I asked the shepherd if he gave names to his sheep: he said he did. I then asked him to call one: he did so, and it instantly left the pasture, and ran up to the shepherd with signs of pleasure. He told me some of the sheep were still wild, but, by teaching, they would soon learn their names, and become tame." Sheep discover remarkable affection for their young; and the more barren the pasture on which they feed, the greater will be their kindness to them. They

are strongly attached, also, to the place in which they have been bred. A Welsh sheep, having a face streaked like a badger's, was brought up among others into Herefordshire for sale, and bought by a farmer, who soon lost it: it was afterwards found to have returned into Wales: it was brought up a second and a third time, and each time returned as before.

*E.* Well, I did not think the sheep had been such a wise creature. I always thought it was nearly as stupid as the ass, which Charles calls stupid to a proverb.

*M.* Charles is as much mistaken about the ass as you were about the sheep. The vegetable and the animal world, as I have often told you, are both capable of considerable improvement, from right treatment, as well as little girls and boys. The dulness and stubbornness of this animal in England are the consequences of ill treatment. What do you think of an ass being so sagacious as to open gates with his teeth, and raise latches with his nose?

*E.* Dear mamma, did you ever know one that could?

*M.* Yes; when I was a girl I used to visit a friend of my father's, who was very fond of animals, and judiciously kind to them. He had a donkey called Robin; and I have often heard him say that he would open the gate of a neighbouring baker's shop to seek for a piece of bun, which they were accustomed to give

him. The late Earl of Egremont formed a team of six asses, and they not only showed an unlooked for degree of strength, but were at the same time gentle and docile ; but he would not allow them to be cruelly treated.

*E.* I am glad I have heard this account ; I shall tell Charles, and I hope he will not say poor Lofty deserves a good beating again when she stumbles. But, mamma, we have passed the corn-field, and I never gathered any of those beautiful scarlet poppies.

*M.* You would not have found any in bloom yet ; besides, they have not at all a fragrant scent. Why did you wish so much to gather some ?

*E.* Because I thought it would be an easy flower to dissect, and to find out the class of : and did not you say laudanum was made from the poppy ?

*M.* It belongs to the 13th class, called Polyandria, containing many stamens ; generally more than twenty. There are in this class several poisonous plants.

And remember, in this class the stamens are all inserted upon the receptacle, and not upon the calyx, as in the class Icosandria.



Class 12 ; Icosandria.



Class 13 ; Polyandria.

*E.* Ah ! Icosandria ; that is the class in which my pretty strawberry plant is.

*M.* Yes, and most of our fruit-trees ; but I believe you wished me to tell you about the poppy : there are six or seven native species of this plant. The opium so much used in medicine is obtained from a white poppy found in Asia Minor. Whole fields are sown with this plant, just as our fields are with corn. When the plants are fully ripe, they are cut with knives, and a white juice runs out. This soon dries in the sun ; it is then formed into cakes of opium, and the substance called laudanum is made by dissolving them in spirits of wine. The farmer is never glad to find those gaudy flowers among his corn : he has enough to try his patience with the depredations of insects, without other enemies.

*E.* What harm do insects do to the corn ?

*M.* When it first rises from the ground, just high enough to show its green blade, it is assailed by a grub of the beetle kind, which eats into the young plant. When the wheat is in bloom, it is infested by an orange-coloured gnat, which pierces the blossom, and there lays its eggs. When these are hatched, the caterpillars prevent the growth of the grain ; and sometimes destroy it in large quantities.

*E.* Then I suppose it is never safe till it is in the granary.

*M.* No, nor even there ; for the weevil devours it. And, besides this, it has three

other adversaries ; one, a minute species of moth, to which the name of wof is given ; the second, a similar kind of insect ; and the third, a grub of the beetle kind, said to do more mischief than either of the others.

*E.* I wonder, amid so many enemies, the poor farmer is ever able to raise any corn at all !

*M.* In this, as well as in innumerable instances, the wisdom and goodness of God may be seen. These little insects become food for others, and for birds. The rook is a great friend to the farmer. In forgetfulness of this, many a rookery has been destroyed ; and the error has afterwards been perceived by the increase of destructive insects.

*E.* But do not rooks steal corn ? I think I heard old John say so.

*M.* Yes ; they occasionally pilfer, but the benefit they confer is much greater than the injury they do. The power they have of discovering the grub of the cockchafer, by the scent, is truly extraordinary. What have you stooped down to pick up ? Oh, I see ; it is the flower of the horse-chestnut. It has seven stamens and one pistil. Can you tell me its class and order ?

*E.* Let me think : I will say the classes over to myself first, and then I shall find it. Seven stamens : oh, it must be in the class Heptandria ; and order—one pistil, Monogynia.

*M.* You are right. The horse-chestnut is a native of the northern parts of Asia, and was brought into Europe about the year 1500. There are very few plants in this class; it contains but one British plant, the *Trientalis*, or winter green.

*E.* Only see, mamma, how beautifully this little bud is folded up! I cannot undo it, with all my care. Do not you remember, when I was a very little girl, how I wanted to pull open the rose by your birth-day?

*M.* Yes; but you are grown wiser now; and you see what lessons of patience and order are given us in every opening flower—in every unfolding leaf.

*E.* I love to watch them day by day; though, before the hyacinth bloomed, I was tired of waiting for them; it seemed such a very long time.

*M.* Dr. Lindley says, “Truly nothing can be more curious than the manner in which these little rudiments of leaves are packed up within the bud, so as to occupy the least possible room; or more remarkable, than the exactness with which the particular mode of folding, peculiar to each species, is observed. There is no uncertainty in the disposition of these minute parts; nothing is left to chance; every plait is ordered by some unseen, but ever-present and wise Being.”

*E.* And did you not once say, that leaves are to plants what the lungs are to us?

*M.* Yes: leaves, by means of their pores and fine vessels, absorb and transmit the air and moisture which surround them. After thus aiding in the nourishment of the extremities of the plant, they throw off from other pores, not merely the superabundant juices, but the air which they had previously taken up; and that in a state far purer and better adapted to the support of animal life than at first. The carbonic acid gas, which plants absorb, is injurious to us; and that which we want to breathe, which is oxygen, they supply us with in return.

*E.* I cannot think what oxygen means.

*M.* The atmospheric air which we breathe is composed of two different fluids, called azotic and oxygen gas: the former is destructive to animal life, the latter favourable to it. But this is a subject we will not talk on at present.

*E.* But, mamma, let me ask you just one more question:—Is the air composed of only these two gases?

*M.* No: it contains a portion of carbonic acid gas, as I have just told you, and a large quantity of water, sometimes invisible, and sometimes visible, in the form of mists and clouds; and you remember I told you, some time since, that the atmosphere was the recipient of all those substances which are subject to evaporation; that is, to have their lighter parts separated from them by heat, or any other cause.



*E.* I shall never look at a leaf without thinking how useful it is to us—giving us good air in the place of bad.

*M.* Leaves have other uses, scarcely of less importance. Those of the grass tribe, by sheathing around them, add much to the strength of the young and tender stems. In trees, they are so admirably placed as to shield the bud, and often the young flower, not only from injury, but from the too great heat of summer ; as well as from the chilling winds of winter.

*E.* Only see, mamma, in this one walk how many differently-shaped leaves I have picked up.

*M.* The shapes of leaves are almost endless : they are simple, compound, or doubly compound. Compound leaves are formed of many simple ones joined together. In leaves are often found sure marks to distinguish plants from each other. Ordinary leaves are composed, first, of a skin, or cuticle, which covers them on both sides ; within this is a green, pulpy mass, called cellular tissue, or, parenchyma.

*E.* I like the first word best, if you please, mamma ; I cannot think of that hard word.

*M.* Inside of all is a woody substance, branching out into delicate veins, intended not only to convey the vegetable juices and secretions, but to strengthen the more pulpy parts of the leaf. But here we are at the garden gate ; go and get ready for dinner.



*E.* I am not at all tired. May I just go and show Charles my moss and wild flowers?

*M.* Not now; you will be too late. Put them all in the root-house till after dinner.

## CHAPTER VIII.

*Emily.* Do, dear mamma, come into the garden and just look at my rose-tree. How very vexatious it is ! I wanted to have gathered you my beautiful moss-rose, and it would have been in bloom in a few days ; but the stem and the leaves are covered with such nasty green insects, I cannot even bear to smell it, lest they should get upon my nose.

*Mamma.* It is, indeed, rather mortifying ; but since we cannot at once stop their ravages, which I hope we shall be able to do shortly, in the mean time let us profit by their depredations. Gather me a leaf, and we will examine it by the microscope.

*E.* Here is a leaf ; and when I look through the glass, some of them seem to have wings.

*M.* That is a remarkable peculiarity belonging to the aphis—for that is the name of this destructive little creature ; though it is also called the plant-louse, and vine-fretter. But I was going to tell you that some of both sexes have wings, and others have not any. Linnæus enumerates thirty-three species which infest different plants and trees ; but later naturalists assert that there are more than

double that number ; and that two or three kinds will often live upon the same tree.

*E.* I wish they would not live upon my rose-tree, that I have watched with so much care all through the winter.

*M.* The aphid has a most formidable enemy in the whole tribe of ichneumons.

*E.* Pray, mamma, what are they ?

*M.* They are flies ; and there are a great many species of them : they receive their name from the resemblance of their habits of destruction to those of the ichneumon or mangouste, that destroys the crocodile. If you search upon your rose-tree, you will probably find many carcasses of the aphid, void of motion, that have been the habitation of a small caterpillar, that has eaten their entrails, and afterwards contrived for itself an outlet, after destroying the aphid. They not only destroy that insect, but caterpillars and wasps also. What are you looking at so intently ?

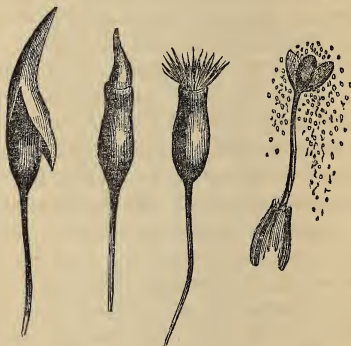
*E.* Only look through this glass, mamma. I see my enemy can walk, for he has six slender legs ; but his body seems large and heavy : he does not get on very fast. The wings of those that have any, stand upright. There are four of them ; and oh, they pierce my pretty leaves with their long proboscis.

*M.* Yes ; they suck the sap-juice from the young shoots ; they attach their eggs in autumn to the twigs of trees, and as near the buds as possible. However, the ichneumon is

a formidable foe to them, having a mouth armed with jaws, and antennæ with more than thirty joints. One striking mark by which you may know them, is, the almost continual movement of their antennæ.

*E.* Now may I put a bit of moss underneath the glass? How beautiful it is! and it seems like a little hood that covers each piece.

*M.* The capsule is covered at first by a veil,



Seed-vessels of Mosses.

1. Veil. 2. Lid. 3. Interior cover. 4. Seed vessel bursting.

called a calyptra ; this, after a time, is thrown off, and shows a second covering, called a lid. During the ripening of the seed, the lid falls off; and then we see a double ring of teeth

arranged, with great exactness, round the mouth of the capsule. The number of teeth is very remarkable: they always consist either of 4, 8, 16, 32, or 64; and not of any intermediate number.

*E.* That is very strange. But here is the wing of a butterfly; and, just as you once told me, I see that soft down is all feathers. Oh! what a beautiful plumage these little creatures have!

*M.* We may learn an important lesson from the wonders that the microscope unfolds. My little Emily is too apt to neglect minute duties, forgetful that these make up in number what they want in weight: an impatient word, a selfish feeling indulged, however trifling a fault in man's estimation, we have every reason to believe is not so in the eye of his Maker. The works of God are as wonderful in their minuteness, as in their magnitude; and, therefore, to be always looking towards the vast and neglecting the minute, is a proof of our weakness as well as sinfulness. Our blessed Saviour set us an example of attention to minute duties: not only did he reprove the angry word, but the angry thought; not only the covetous act, but the covetous desire. He tells us that strait is the gate and narrow is the way that leadeth unto life: that unless our righteousness exceed that of the scribes and Pharisees, we shall in no case enter into the kingdom of heaven. Now the scribes

and Pharisees took much pains with their outward and formal ceremonies of religion ; much more than many, who call themselves Christians, do at the present day. Therefore, you see, the meaning is spiritual, and refers to the state of the heart, the motive, the inward principle. Ask yourself often, What is my motive in this action? Who am I endeavouring to please? Is it myself or my fellow creatures, or is it God?

*E.* I will try to do so, dear mamma. But hark ! Did you not hear the cuckoo just now ? It must be very near the window : how I wish I could see it ! Is the cry of the cuckoo called his song ?

*M.* Yes ; and our pleasure in hearing that sound seems to me to arise more from association than from any other cause.

*E.* I do not know what that word means ; and yet I seem to know.

*M.* That knowledge is very useless to us, which we only seem to have, and cannot define. Association means the union of one idea with another : thus, with the cuckoo, we always connect the idea of spring.

*E.* Oh yes ! I remember : it says in the poem——

*M.* You mean Mr. Logan says——

“ What time the daisy decks the green,  
Thy certain voice we hear ;  
Hast thou a star to guide thy path,  
Or mark the rolling year ? ”

The cuckoo comes to us in April, and does not leave us till July or August. He is supposed to migrate, with his mate and family, to Africa, since these birds are found twice a year, on their voyage backwards and forwards, in the island of Malta. In summer, they visit some parts of Europe still further to the north.

*E.* Do any other birds come to us in the month of April?

*M.* Yes, a great number of your favourites. The black-cap and the garden fauvette come in April, and do not leave us till September. The nightingale, too, our finest warbler of all, arrives at that time to cheer us with its delightful song. I should like you to have a little book, which you might call a calendar of nature, and just put down what you notice of the coming of birds, the opening of flowers, the leafing of trees, etc. So much has been done for little girls by the information of others, that I sometimes fear lest they should fail to employ those powers of observation and reflection with which God has graciously endowed them.

*E.* Did Linnæus, then, observe the things he saw?

*M.* Yes. Linnæus, in the most earnest manner, exhorted his countrymen to observe, with care and diligence, at what time each tree unfolds its buds, and expands its leaves; imagining, and not without reason, that his

countrymen would, at some time or other, reap advantage from observations of this kind, made in different places. Towards the end of September, which is the best time for sowing wheat, we find the leaves of the oak of a yellowish green; sycamore, dirty brown; maple, pale yellow; ash, a fine lemon; elm, orange; hawthorn, tawny yellow; and cherry, a red colour.

*E.* I should like to be able to draw trees and flowers as well as my dear cousin Mary Ann does.

*M.* Without being able to delineate them on paper, you may, by observation, have so vivid an impression of their varied beauties on your mind, as to awaken many emotions of pleasure and gratitude. The smooth-stemmed beech, the spreading oak, the delicately pensile branched birch, the thick and solemn cedar, and the lofty pine, each has its distinct character and use.

*E.* I think, when the leaves are off the trees, in the autumn, I might draw some of them from nature. My cousin says that is the way she at first sketched them.

*M.* You may do so, if you please: they are just now clad in vernal beauty, so you must wait some months first. Trees generally lose their leaves in the following succession. Walnut, mulberry, sycamore, lime, ash—horsechestnut I should have said next to the mulberry; then, after an interval, elm; then beech and oak; apple and pear trees sometimes not



till the end of November ; and lastly, pollard oaks, and young beeches, which retain their withered leaves till pushed off by the new ones in spring.

*E.* Mamma, I hear some bird singing so sweetly : I wish I could tell where its nest is.

*M.* It would not long occupy it, if it saw your little head peeping in. It is the missel-thrush you hear ; and I think its nest is in the pear tree.

*E.* What does it build its nest of ? All birds do not use the same materials, do they ?

*M.* No : there is a wonderful variety in their materials, situations, and forms.

*E.* Tell me where some of the dear little creatures build.

*M.* The wren often places her nest in the roof of a cottage ; sometimes in an old stump of a tree that is covered with ivy ; and so sensitive is she, that if her nest be only touched by thoughtless little school-boys, she will seldom ever enter it again. The thrush uses hay and wool in the construction of her nest ; the wren builds her's principally of moss. The nest of the little brown linnet is remarkably beautiful : it is made of moss and wool, and lined with the pure white down of the willow catkin. Its eggs are of a delicate, bluish grey, spotted with brown ; the interior is very small, not larger than half a hen's egg.

*E.* The other day, when I was in the orchard, I saw some boys in the lane looking

so at the apple trees, and Charles says they were searching for chaffinches. I hope they will not find any.

*M.* I hope so too, but no doubt they knew that the chaffinch often builds in apple trees ; its nest is very beautiful ; spangled with silvery lichens, and lined with soft cow-hair.

*E.* I wish boys would not be always trying to take birds. I suppose, if they did not sing, they would not care for them ; so it is dangerous to have a sweet voice.

*M.* Birds, in a wild state, seldom sing longer than ten weeks in a season. The first sound they utter is a cry for food ; and persons skilled in the matter can distinguish what kind of birds are chirping, though the nest is out of sight. The irregular notes expressed by birds in learning their song are called by the bird-catchers, recording.

*E.* Learning, mamma ! Do they need to learn their song ?

*M.* Yes : patience and perseverance are required by the little bird in acquiring those harmonious sounds which so delight us : and how much more needful, then, must these qualities be for rational creatures !

*E.* Dear me ! I thought a bird would sing, although it had never heard the notes of any other bird.

*M.* In that case, it is most probable it would not sing at all. It appears, from Mr. Barrington's experiments, that singing in birds is

the effect of imitation. He prevented several nestlings from hearing their parents' song. Among others, he brought up a linnet under a tit-lark, and when he was perfectly grounded in the tit-lark's song, he hung his cage near those of two linnets ; yet he never learned their notes, though of the same species, but continued to sing like a tit-lark.

*E.* Did Mr. Barrington try any other experiments ?

*M.* Yes, several ; and at some other time you may read about them. But now you had better go down the field and meet your brother, who, I should think, will have returned from school by this time.

## CHAPTER IX.

*Emily.* Charles has been such a delightful walk—to Digby Hall, mamma, and the gardener gave him out of the green-house this



Heath. (*Erica*.)



Class the 8<sup>th</sup> ; Octandria.  
The common Maple.

beautiful piece of heath ; and he says he thinks it will dry very nicely, and do for my herba-

rium. Do you think it will? And here is a piece of maple too.

*Mamma.* Yes; but in general it is better to have wild flowers for your specimens; but I suppose Charles could not find any on the common so early in the season as this. All the common heaths are evergreens, and are in flower from July to September or October. Common ling, or heather, is frequently found on wastes and open tracts of country, so that such places are called heaths. The flowers are a reddish purple, very numerous, growing all along the young shoots. We use the stems for brooms and fuel. The Highlanders make beds and thatch their cottages with it. Mrs. Grant says—

“Flower of the desert though thou art,  
The deer that range the mountain free,  
The graceful doe, the stately hart,  
These, food and shelter seek from thee.  
The bee thy earliest blossom greets,  
And draws from thee her choicest sweets;”

for the bee extracts a great deal of honey from the flowers of heath.

*E.* I have often seen the busy little creatures humming over the moor, when it was all purple with heath.

*M.* *Erica*, or heath, has eight stamens and one pistil: can you tell me its class and order?

*E.* Its class must be Octandria, and its order Monogynia. You told me, a little while ago, the

fuchsia was in this class. Are there many pretty flowers found in it?

*M* A great many: I will tell you a few of them; and the others you will learn by degrees, by dissecting them. The country about the Cape of Good Hope is abundant in heaths: many of our choice ones, found only in the green-house, come from the Cape. It is said to produce more than 250 species. The evening primrose, cranberries, and mezereon all belong to this class: but one of its most interesting plants is the lace bark tree, so called from its being formed in layers, that, when separated, exactly resemble lace.

*E*. Dear me, how very strange! but I suppose nobody could ever wear such lace?

*M*. Yes indeed, it can be worn; and Swartz, a famous botanist, says that it may be washed without injury. King Charles II. is said to have had a cravat made of this lace, presented to him by the governor of Jamaica, of which I understand it is a native.

*E*. Can you think of any other curious plant that belongs to this class?

*M*. Yes; the poplar, of which there are three or four native species, belongs to it. The bark of the black poplar is sometimes employed by fishermen, instead of cork, to support their nets, it is so remarkably light. Can you tell me what cork is?

*E*. Cork grows, I think, but I do not know where.

*M.* It is the outer bark of a species of oak, growing in the south of Europe and the north of Africa ; it does not attain perfection till its twenty-third year, and from that period it continues for about 150 years to yield good cork every tenth year.

*E.* Oaks grow in England. They are very valuable trees, are they not ?

*M.* Yes ; two species of *Quercus*, or oak tree, grow in England ; one of which, the *Quercus robur*, is particularly valuable : it is very long-lived, and sometimes measures from fifty to sixty feet round. The roofs and framework of almost all our ancient buildings are formed of this timber. Oak sawdust is used in dyeing the different shades of brown and drab colour ; the bark is used for tanning leather ; and you know the use of the acorns.

*E.* Oh yes ! I have often seen tanner Dawson's pigs scampering after them.

*M.* Deer are also very fond of them. The cork brought from Spain, after being soaked, is placed over burning coals, which give it that black appearance you see.

*E.* Do you know, mamma, the boys have nearly cured Tom Brown of his vanity ? Your mentioning Spain put me in mind of him. He is to go over to Madrid, to his uncle, when he leaves school, for a whole month. They called him sir Thomas Puff. Was not that a good way to cure him ?

*M.* Indeed, I am not of your opinion. The

best way to correct faults in others, appears to me to be, to exemplify in our own temper and conduct just the opposite quality, and by that means we ourselves are gainers. Besides, I much doubt whether any moral defect was ever radically cured by ridicule ; and the person who employs it is using a dangerous weapon, which must prove injurious to his own humility.

*E.* Charles brought me this nice piece of gum from the cherry-tree in the orchard. He says it will do to fasten my shells in the grotto. Have all trees gum ? I thought it came from abroad.

*M.* The sap in trees is converted into various substances, differing in every species of plants. Gum is formed in the cherry ; resin in the fir. Our best gum-arabic flows from the acacia in Egypt and Arabia.

*E.* I cannot think why plants should be more hurtful in the dark than in the light. I should like to have some in my bed-room.

*M.* I will give you a reason for not complying with your desire :—all plants, in the light, absorb carbonic acid gas, and emit oxygen. In the dark, on the contrary, they absorb the latter and give out the former by the same surfaces.

*E.* Thank you, mamma. I will not again ask you to let me have plants in my bed-room.

*M.* When I refuse to comply with any wish you may form, you may rest assured that I always have a reason for so doing, though I



may not always explain it. There are many facts in nature we can know only by experience, from our imperfect knowledge of chemistry and vegetable physiology.

*E.* I do not know the meaning of that word.

*M.* Vegetable physiology means, the structure and functions of plants. We cannot account for the fact that the same organs secrete a poison in the night-shade, and a wholesome food in the potato, which it so strongly resembles in form : they are both in the class Pentandria.

*E.* Potatoes do not grow wild in this country, do they ?

*M.* No ; they were brought from America by sir Walter Raleigh in the year 1597.

*E.* I have been thinking what food do plants require ; only water ?

*M.* Animal and vegetable matters are dissolved in water by putrefaction. Various salts and earths, besides water, are the chief nourishment plants derive from the soil : the roots, too, absorb air.

*E.* Plants are much more important, are they not, than most people seem to think ?

*M.* The care with which Providence has provided for the well-being of plants, shows us that they are of great importance. That they may never become extinct, the number of their seeds is often immense. Ray counted 32,000 in one poppy-head ; and, as I have before told you, where the seeds are less numerous, their

safety is secured by other means. Botanists are acquainted with nearly 100,000 species of plants; and we learn from naturalists, that perhaps every one is the dominion of a different race of insects. Every leaf is daily pouring forth oxygen gas, without which, you know, no animal could breathe: wood is connected with every necessary and convenience of life. So you see the existence of plants is graciously ordained by our heavenly Father to promote the welfare of the other parts of creation.

*E.* Buds, too; how carefully they are wrapped up!

*M.* Yes; covered with scales, and often coated with resin or gum.

*E.* I hear some bird singing so sweetly; can it be the nightingale?

*M.* No doubt it is. The nightingale may be heard at half a mile's distance, which, considering its size, is really surprising. But the moon will have climbed the highest hill that rises over your little bed-room, before your eyes are closed in sleep, unless you put your work away and prepare to depart now.

*E.* I am not at all sleepy, and I do so love to talk by this soft twilight. Does it not say somewhere that twilight has magic tints?

*M.* You are thinking of the poem I was reading the other day, Rogers' "Pleasures of Memory," in which he says—

"Twilight's soft dews shed o'er the village green,  
With magic tints, to harmonize the scene."

*E.* Oh ! magic tints ; and so it has.

*M.* But, my dear little girl, you have important duties to perform before closing your eyes in sleep ; and it is not well to enter on the difficult task of self-examination with wearied mental and bodily powers : not only your actions must be examined, but the motives which led to them. When you find, as alas you will find, that these have been very impure, implore earnestly the aid of God's Spirit for the future. This cannot be done with a body weary, or a mind diverted to other objects. Remember, as the excellent Mr. Cecil said, "since the fall of man, whatever is good must spring up under the cross." You understand me, dear : do not fail to acknowledge Him who has stooped so low to acknowledge you. Consider what manner of love God has bestowed upon you : for you, a sinful child, he has given his only-begotten Son, to redeem you from the power of Satan, and to make you an inheritor of eternal life. Your privileges are great : your responsibility for these advantages should awaken watchfulness and prayer.

*E.* I do not know what you mean by that word responsibility.

*M.* Responsibility means that God requires the improvement of all his gifts to us. Every blessing brings with it a corresponding duty. You remember the parable of the talents.

*E.* Yes, and the servant who was called

wicked and slothful, because he had put his talent by in a napkin. Dr. G. said, on Sunday, he did not appear to have made a bad use of it, only he had neglected to use it at all.

*M.* On that account he was condemned. His views of the benevolent master of the vineyard, that he was a hard man, reaping where he had not sown, gathering where he had not strawed, resemble our views of God by nature. Born in sin, we are alienated from God by the vain things of this life, till his Holy Spirit takes of the things of Christ, and reveals them unto us. That they may be so revealed to you, and your brother, and little sister, is the fervent prayer of your often anxious mother.

## CHAPTER X.

*Emily.* Another fine morning ! How sweetly the brier smells !

*Mamma.* Yes ; but it will be too warm for you to walk to-day before the evening.

*E.* Do not say so. I shall not be too warm ; and I want to go with Charles to the water, where he says there are some beautiful pink flowers, surrounded by narrow leaves, growing in the water.

*M.* *Butomus umbellatus*, you mean, or the flowering rush. The first is its Latin name. It is the only British plant in its class ; and if you can tell me in what class it is, you shall go : it has nine stamens and six styles.

*E.* Oh, dear me, it is the ninth class ; but I never can recollect that hard word : I will say them all over. I have got it ! It is in the class Enneandria, and order Hexagynia.



*M.* Here is your brother, with some of them in his hand : he has been for you.

*E.* I must, if you please, go myself to the water and see them, for these are sadly faded.

Class 9 ; Enneandria,  
*Butomus umbellatus*,  
or Flowering rush.

*M.* They are indeed ; but they will answer

our purpose to examine. Though termed the pride of the Thames, you see

“She cannot live from her home afar,  
And she fades before the evening star.”

You see the nine stamens very clearly.

*E.* Only one plant in this class, did you say?

*M.* Only one of British birth, but several important ones of foreign climes. The laurel, cashew nut, and rhubarb, are all in this class; and the sweet bay tree, *Laurus nobilis*, a native of Italy, and said to be the true laurel of the ancients, with which they crowned their generals.

The cinnamon tree, another species of laurel, is a native of Ceylon. The plant is covered with a bark, at first green, afterwards red; it is peeled off, cut into slips, and dried in the sun. The fruit is shaped like an acorn, but is not so large. When the seeds are boiled in water, they yield an excellent oil.

*E.* You said rhubarb was in this class: did you mean that nice plant that grows in the garden, or the medicine?

*M.* Rhubarb is a native of Turkey in Asia, but it is brought into this country and planted in our gardens. We use the young leaf-stalks, as you know, for tarts. The Chinese rhubarb, and a species that grows in Tartary, having thick fleshy yellow roots, are what we use in medicine.

*E.* Now will you go with me out at the garden gate? Charles says the piece of water

where those pretty flowers are, is just at the bottom of the lane ; not far, you know.

*M.* Yes ; put on your nankeen bonnet. Do you know what this exterior covering of plants is called ? Did you ever notice how it varies in different plants—how smooth it is over the petals of most flowers—how downy on the peach, rough on the oak, and, as I have before told you, perforated with poisonous hairs on the nettle ? It is the epidermis, or cuticle, answering the same purpose as the scarf-skin of animals, protecting the interior and more tender parts from the injuries of excessive heat and cold ; yet, being porous, it allows the absorption and emission of moisture and air, and the admission of light.

*E.* Only look, mamma, at this caterpillar ! You did not see it, I suppose, for you nearly crushed it with your finger.

*M.* No, indeed I did not : it is the coronet moth, which feeds on the privet, and, as you see, is exactly the colour of the leaf.

*E.* How very curious ! Are caterpillars often the colour of leaves ?

*M.* Some are the colour of the leaves they feed on. Those that live in darkness, in wood, or the inside of fruit, are generally white : others, as you have often seen, are adorned with a variety of beautiful tints ; but you must not suppose that such always produce butterflies equally variegated.

*E.* Must I not ? I thought a beautiful

caterpillar would be sure to be a very gay butterfly, with just the same colours on it.

*M.* No ; it is often just the reverse ; and sometimes an ugly—if we can use that word to any of God's productions—I would rather say, a caterpillar void of any brilliant tints, will be a very beautiful butterfly. However, in the common currant moth, the caterpillar of which is white, ornamented with several black spots, and the extremities yellow, all these colours may be found in the butterfly ; but that and the green caterpillar, which produces a green moth, are exceptions rather than the general rule.

*E.* Oh ! here is a sweet-pea in bloom : I am very glad, for I thought they were a long while in coming.

*M.* Now gather one, and see if you can tell me its class, etc.

*E.* This is a most curious flower to dissect. Only see ! here are ten slender threads, concealed in this case.

*M.* That case is termed the keel, from its resemblance to the bottom of a boat. This flower is in the 17th class—*Diadelphia*. I hope you have not forgotten what I once told you :—*Monodelphia*, one brotherhood ; *Diadelphia*, two brotherhoods : plants with the stamens united into two parcels, as the sweet-pea, broom, and others, are thus denominated.

*E.* Was it not the broom that so delighted



Linnæus when he first came to England, that he fell on his knees at the sight of it?

*M.* It was not broom, but furze, that which you see on the heath. It is not so common in other parts of Europe as it is here. Portugal and France have it, but not many other countries besides. Linnæus tried to transplant it into Sweden, but he was not able to do so.

*E.* I think, mamma, Linnæus must have had a very warm heart to fall down and kiss the furze.

*M.* I never heard that he did that. He fell on his knees, I should rather imagine, to express his gratitude for the varied and beautiful gifts of God in nature. He not only had a warm heart, but a well-disciplined and cultivated mind, without which a warm heart is often a dangerous possession. Linnæus on one occasion felt so angry with a person who had injured him, that he went out, determined to be revenged; but not meeting with his enemy, he had time for reflection, and, I hope, for repentance, since he relinquished his sinful determination.

*E.* This pretty broom, growing up among the white syringa, is not the same plant, is it?

*M.* No, not exactly; though they are both in the class Decandria. This broom was once called *Planta genista*, whence arose the family name of Plantagenet. Can you tell me how

many princes of this name sat on the English throne?

*E.* I think fourteen.

*M.* Yes; and I will tell you how the name originated:—Geoffrey, count of Anjou, once wore a sprig of broom in his helmet when he went to battle: you know broom was then



Weld. (*Reseda*.)

called *Planta genista*. This count afterwards married the daughter of Henry 1., Matilda, and from them descended our Edwards, Richards, and Henries.

*E.* Is broom a useful plant? Do people eat any part of it?

*M.* The name shows the use to which much of it is applied. The young shoots have been used in medicine, and the buds are often picked and used as capers.

*E.* Only see, mamma, what a quantity of London-pride we have here! I wish the gardener would root it up, and put something prettier in this corner. I neither like the name nor the flower.

*M.* And yet, from this little insignificant plant springs the beautiful genus of pinks, of which you are so fond. London-pride is found in the same class and order—Decandria, Digynia; that means the second order of the 10th class. Although you complain of the name, it is a humble little flower to condescend to bloom here; for its natural situation is on high mountains.

*E.* Ah! I see I must not judge by appearances.

*M.* No, indeed you should not; but you often need reminding of this truth.

*E.* Does the class Decandria contain many plants, mamma?

*M.* Yes; both the classes Pen-Class 10; Decandria. Sapona-tandria and Decandria are very ex-ria.

tensive; the latter contains, perhaps, 1000 species of plants, somewhat varied in character.

*E.* A thousand! dear me, I do not think I shall ever know them all.



*M.* You must proceed step by step, and not attempt to ascend your ladder too hastily. Independent of the leguminous or papilionaceous plants, there are, in this class, rhododendrons, kalinias, azaleas, and the arbutus ; the catchfly, the chickweed, the lychnis, stone-crop, with its many species ; the pretty moss-like saxifrages, the grand mahogany, Brazil wood, and the *lignum vitæ* tree.

*E.* I do not quite understand about papilionaceous plants—do I say the word right? I thought the sweet-pea was called *Diadelphia*, from the stamens being in two little parcels.

*M.* You are right ; the class *Diadelphia*, which you have not yet learned, consists wholly of papilionaceous plants ; so called from the Latin word *papilio*, a butterfly, which they strikingly resemble. Some flowers, however, of this description, are found in the class of which we are speaking, *Decandria*.

*E.* I think, mamma, the classes and orders are rather puzzling.

*M.* They are to an inexperienced little botanist ; but your best method of obtaining correct information will be to dissect the flowers : remember, in the 11 first classes, the number of stamens decides the class to which your flower belongs. Insertion of the stamens is considered in the two following, *Icosandria* and *Polyandria*. Now, can you explain to me these two last ? I have often told you them.

*E.* Oh yes ! I have not forgotten them.

The rose is in the class Icosandria; it has 20 stamens, and sometimes more, inserted, you said, in the calyx; and now I always know when I see flowers of this class inserted into the calyx. Polyandria—stamens numerous, but they are inserted into the receptacle; and you showed me the difference in the poppy.

*M.* You have remembered very well; and I will now only tell you, the length of the stamens is considered in the 14th and 15th classes—Didynamia, 2 long and 2 short stamens; Tetradynamia, 4 long and 2 short stamens.

*E.* Oh dear! those words are very hard to remember.

*M.* In the three next classes the union of the filaments of the stamens is characteristic of the class; and those you already know. Monodelphia, Diadelphia, and Polyadelphia; Stamens united into one parcel, in the first; into two, in the second; and into more than two, in the third.

*E.* And now, mamma, cannot you tell me something entertaining about some of the plants in the 10th class? for then the hard word will come with the entertaining thing, and help me to remember it; and that is so nice, you know.

*M.* It would, indeed, be very nice, as you term it, if all solid information could be rendered entertaining; but, as that cannot be the case, the industrious and persevering will far surpass the idle and self-indulgent.

*E.* Yes, mamma. Did you not say the mahogany tree was found in this class? Where does it come from?

*M.* It comes from the warmest parts of America, and some of the West India islands. The seeds are very light, and are often blown into the chinks of rocks, where they take root, and produce trees of considerable size. I am told the wood, in these exposed situations, is harder than what grows in other places.

*E.* I wonder what made people first think of having it for sideboards, boxes, and such things, more than any other wood.

*M.* Mahogany was first brought to England about 130 years ago, by a West India captain, as ballast for his ship; and, being found too hard to cut with the common tools used by carpenters, was laid aside as useless. The captain's wife, however, being in want of a box to hold her candles, thought that one made of such hard wood would answer better to keep out the mice, and had stronger tools employed to make one. The wood was then found to be so beautifully veined, and to take so high a polish, that the fame of mahogany wood soon became general, and it has since been imported into this country in large quantities.

*E.* I am glad the want of a box to keep out the mice made the captain's wife more persevering; it would have been a sad thing to have thrown such beautiful wood away. I suppose no other wood is so heavy as mahogany

*M.* Yes, indeed, the wood of the *lignum vitæ*, a tree in the order *Monogynia*, of this class, found in the West Indies, is so heavy, that it sinks in the water ; and so hard, that it breaks the tools employed in cutting it down.

*E.* Then it cannot be of much use.

*M.* It is seldom used for common purposes, but it is of great use to sugar planters, for making wheels to their sugar mills. The wood, the bark, the gum, the fruit, and even the flowers of this tree, it is said, are useful in medicine.

*E.* See, mamma, what curious things those are, growing on that old gooseberry bush.

*M.* They are lichens, and, like the mosses, are found to thrive in all kinds of soil, and in every climate. Several species of them afford beautiful dyes ; one of them, called dyer's lichen, or orchall, is valuable from its giving to wool and silk various shades of purple and crimson.

*E.* Is it found in this country ?

*M.* No ; it is brought chiefly from the Archipelago, and Canary Islands ; but the purple powder, called cud-bear, used in dyeing purple, is prepared from the lichen, called *tartareus*, which is common in many parts of England. It can be used only in dyeing woollen cloth, as it does not communicate its colour to vegetable substances.

*E.* Is this chafer dead, do you think,



mamma? Only see ; its legs are as stiff as if they were made of wire, and it is quite motionless.

*M.* No, I do not think it is, dear ; but I suppose it is under some apprehension from your having inadvertently touched it. The attitudes which insects assume, to screen themselves from danger, are very remarkable. You see the mode the dung-beetle adopts. The tree-beetle elevates its posterior legs into the air, with the same view ; many beetles, especially those of the weevil kind, roll themselves up, and fall from the plants on which they have been feeding ; and then they are so much the colour of the ground, that, for a time, they are quite safe.

*E.* I do not fear any of that kind of creatures ; but I do not like those nasty little things, something like lizards, called efts.

*M.* And yet I believe they are perfectly harmless. You should not have run away so soon after dinner yesterday, or you would have heard a most amusing account Colonel Monkton was giving of the lizards in Malta. He says, a species called the *Lacerta agilis* is particularly beautiful and numerous, in both Sicily and Malta. When he was travelling with a friend, at the latter place, they were determined to try what effect the humming of a tune would have on these little creatures, for they did not believe the report they had heard that they were attracted by music. The



effect was most entertaining. Colonel Monkton and his friend were seated on a rock : the lizards came out, and stood nearly upright on their fore-legs, the hinder ones lying almost flat on the ground ; and, if they substituted a whistle for a tune, the lizards would nearly suffer themselves to be taken : the head was turned on one side, as if for the purpose of accurately hearing.

## CHAPTER XI.

*Emily.* Oh dear, oh dear ; how very dull it is !

*Mamma.* What do you mean by dull ?

*E.* Oh, mamma, you know what dull means ! The rain makes everything look so gloomy.

*M.* And yet there is much to excite both our wonder and gratitude in the gently falling drops, refreshing and fertilizing the objects on which they descend.

*E.* Yes, mamma ; but everything, I mean every body, is dull to-day. Charles's mathematics make him so disagreeable : I asked him which colour he liked best to put my wild geranium on, now that I have dried it ; and he put his elbows on the table, and his hands up to his ears, and only shook his head, instead of answering me.

*M.* I am sorry your brother should be uncourteous ; but, remember, there is a generosity in judging of others, and a sympathy with their feelings, more important to their happiness, and consequently more valued by them, than all we can bestow upon them ; and I have been sometimes grieved to see how completely you forget this, when yielding to your own feelings.

*E.* Indeed, mamma, I do not wish to be selfish ; I am sure I would give Charles anything I have, or do anything I could to help him.

*M.* And yet you do not always put the kindest and most favourable construction on his actions, when they thwart your inclinations ; and though you say you would do anything to help him, you continually interrupt him by trifling questions, when he is at his studies. Real sympathy, the bond of all friendship, should lead you to regard the mental and bodily feelings of those you love, and not exclusively to consider your own. You forget the beautiful injunctions of the apostle Paul : “Be of the same mind one toward another. Rejoice with them that do rejoice, and weep with them that weep.” “Look not every man on his own things, but every man also on the things of others.” These sacred precepts must not hold their place in your memory alone, but be brought out into daily practice. Do you recollect, in the 7th chapter of Matthew, the description of the wise man who built his house upon the rock ? It was not he who only heard our Saviour’s words, but he who did them—who put them into action. You say you do not wish to be selfish ; the merely wishing not to be so will never eradicate the evil, which is in our nature. Selfishness is like the hydra, ever assuming a new form ; and, as you have not strength to destroy him, your weapons must be those of faith, watchfulness, and prayer.

May you be enabled, in some humble measure, to follow the example of your blessed Saviour, whose life was one continued course of suffering and self-denial : the former you are not called to ; the latter you must not live a day without.

*E.* Indeed I am sorry I was so unjust as to think poor Charles cross, because he could not attend to me : but everything to-day makes me feel dull. I have been waiting all the morning for my cousin Mary Ann, and I do not think she will come now, it rains so fast.

*M.* You forget that—

“The things that charm and leave us  
Are fancy’s fairy elves ;  
All that can joy or grieve us  
Exists within ourselves.”

Come here, and look through this painted window ; tell me what you see through the violet-tinted pane, and then raise your eye to the next.

*E.* Oh ! it is gloomy indeed when I look through the violet colour ; but that bright amber, notwithstanding the rain, when I look through that, everything looks quite bright and beautiful.

*M.* And I wish to remind you, it is just so with the passing circumstances of life, as we view them through a discontented, or cheerful and grateful mind. Self-regulation, you know, is the secret of happiness ; and when we cannot bring our circumstances to our minds, we may bring our minds to our circumstances. Too

many persons, as well as yourself, are apt to forget that this world is not intended as our resting-place, our home ; it is one of trial, in which, through Divine grace, those habits and dispositions are to be acquired, which are to prepare us for a better. And when we consider how short and uncertain a time is allotted us for this important object, we should use great diligence and earnestness.

“From watching at thy post below,  
No hour of respite must thou know ;  
Lest some lov'd sin, in soft disguise,  
Should cheat thy tired and listless eyes ;  
And some low whisper falsely say,  
My Lord his coming does delay.  
Oh ! heed not thou the dangerous sound,  
Thou 'rt on the world's enchanted ground.”

*E.* I will try not to heed that sound, mamma, but daily watch and pray. Only see ! I think, after all, it will clear up : those little flies make me think so, they seem so merry—now dancing here, now there.

*M.* And you may learn a lesson of cheerfulness and equanimity from these little insects ; for these dances are kept up at all seasons of the year, only that in winter they are confined to the robust *tipulæ*, or gnats, which, however small, are often seen on a sunny day in December, even when snow is on the ground, sporting as merrily as in the spring.

*E.* I wonder the heavy drops of rain do not kill them : see what a number 'ere are outside the window.

*M.* Yes, indeed it is wonderful. Mr. Kirby, who has written on Entomology, says that the smallest gnat will fly unwetted in the heaviest shower of rain. How keen must be their sight, and how rapid their motion, to enable them to steer between drops bigger than their own bodies, which, if they fell upon them, must dash them to the ground ! Is not this another proof of the care that God takes of the smallest of his works, and, in our estimation, perhaps the most insignificant ?

*E.* I do not know the meaning of the word you used a little while ago ; you said Mr. Kirby had written on—

*M.* On Entomology, which means the habits and structure of insects.

*E.* I think there are more rainy days in England than any where.

*M.* The annual quantity of rain is greatest at the equator, and decreases gradually as we approach the poles : and yet the number of rainy days is smallest at the equator.

*E.* I do not at all understand how that can be.

*M.* I will try to explain it. The number of rainy days is often greater, you know, in winter than in summer ; but the quantity of rain is much greater in summer than in winter.

*E.* Oh yes, I understand ; because in summer it comes down in such torrents.

*M.* The drops of rain increase so much both in bulk and motion during their descent, that

a bowl, placed on the ground, would receive, in a shower of rain, almost twice as much as a bowl placed on a neighbouring high steeple. More rain falls in mountainous countries, than in plains. Among the Andes it is said to rain almost perpetually; whilst in Peru and Egypt, it scarcely ever rains.

*E.* What is rain, mamma? what makes it?

*M.* Thick clouds, condensed by the cold, and by their own weight falling upon the earth in small drops of water. If the particles of the dissolving cloud meet in coming down with a tolerably hot air, these drops will be so small, that they will form only mist.

*E.* Oh I would rather see large drops of rain, than that nasty mizzling; making everything so damp and uncomfortable.

*M.* Do not, my dear child, let your happiness be affected by such trifles. Be grateful also, that we are preserved from the calamities that the rain occasions in some countries. In the year 1421, the rain was so great in Holland, that, an extraordinary flow of the sea succeeding, there were 70 villages overflowed, and 100,000 men drowned.

*E.* May I open the window now? I think the rain is quite over. How sweet the mignonette smells! but I cannot tell in what class it is: ought I to know, mamma? have I learned it?

*M.* Yes, you have learned it; but, as it is

rather a difficult flower to dissect, I will tell you ; it is in the class Dodecandria.



Class the 11th ; Dodecandria : number of stamens, from 11 to 19 inclusive.

*E.* Oh I remember ; that is the 11th class, containing plants with more than ten and less than twenty stamens.

*M.* You are quite right : it is a small class, to which are referred only eight British plants ; one of these is mignonette, sometimes called *Reseda* ; in its wild state, it decorates many of our chalk-pits and old walls. No plant is so

much used as this in dyeing yellow ; the colour it yields is very bright and beautiful. The dyers use the whole plant, though it is said the seeds alone contain the dyeing matter. It does not undergo any other process than being pulled up at the proper season, and tied into bundles, when not wanted for use. It is merely boiled with alum ; and the goods, which may be either cotton, woollen, silk, or linen, are dipped into the liquor.

*E.* How the long spikes keep nodding at the top !

*M.* Yes ; that peculiarity which some plants have is called nutation. Linnæus said, flowers of this description followed the course of the sun ; being towards the south at mid-day, east in the morning, and west in the evening. Have you never noticed, in a field of wheat, almost



all the ears bend down in the same direction, towards the south? Some persons have supposed that the sun-flower follows the course of the sun, because the stem is bent just under the flower, which makes it turn down sideways. But this is not the case; the sun-flower does not turn round to different parts of the heavens at particular times of the day. If you observe, you will see it does not.

*E.* This little insignificant flower, dear mamma, does quite puzzle me. I can neither find the stamens nor pistil. ✓

*M.* Linnæus himself acknowledges that there is scarcely any genus so difficult to determine as that of *Reseda*, the number and shape of the parts of the flower varying considerably in different species. The garden mignonette, *Reseda Odorata*, is a native of Egypt, and is, you know, an annual.

*E.* That means bearing leaves and flowers in one year, and then dying.

*M.* Yes; many plants, that are annual in warm climates, become biennial, or live for two years with us; because the heat of this country is not sufficient to bring them to perfection in one year, and the seeds do not ripen till the second summer.

*E.* I wish, mamma, there was some easy flower, I mean all the parts easy to find, I could examine in this class.

*M.* Wait for a month or so longer, and, on neighbour Brown's pretty cottage roof, you

will find plenty of houseleek, and that is a very clear specimen for you to dissect in this class.

*E.* Do you mean those pretty star-like flowers, of a rose colour, with very thick leaves?

*M.* I do : its Latin name is *Sempervivum*, which means "always alive : " it remains uninjured during the sharpest frost, or the hottest sunshine.

*E.* Dame Brown once told me the leaves were very useful to cure burns or bruises ; she cured her little grand-child's hand with some of it.

*M.* The houseleek has twelve pistils ; can you tell me the order ? It is in the class Dodecandria.

*E.* I think you once told me, whenever there were about that number in each flower the order was called Dodecagynia.

*M.* The number of stamens varies under different circumstances, even in the same species. In the houseleek you will often find that the number of the different parts of the flower varies according to the richness of the soil in which the plant has grown. This class is rather an unsatisfactory one for a young botanist ; the next will be far more interesting ; I dare say you can name it.

*E.* Yes, that I can, my favourite class, Icosandria ; none of them noxious, as is said in my little Botanical Grammar.

*M.* Look! who is that coming down the garden-walk?

*E.* Ah, it is my dear cousin Mary Ann; you see, mamma, she did not fear a shower of rain. The sun is coming out to welcome her; but if he did not I should not care, for she always brings sunshine.

*M.* Well, run along, chatterer, and bring her into the parlour, for I am sure she must be tired.

## CHAPTER XII.

*Emily.* Since tea, mamma, I have been all round the garden, with my cousin, finding out all the plants in the class Icosandria ; and, do you know, we have counted more than a dozen damask roses, besides moss roses, and the common cabbage rose.

*Mamma.* The damask rose differs from every other ; and botanists, having shown by what specific marks it may be distinguished, have determined it to be a species.

*E.* A species, mamma ; what does that mean ?

*M.* Independent of any general arrangement, plants are divided into species, genera, and varieties. There are many other roses, which, though having specific points of difference, very closely resemble the damask rose. These, botanists have collected into one family, which they term a genus. Rose is the generic name ; but, to distinguish the species, every one has a separate name ; thus, the damask rose is *Rosa centifolia* ; the dog rose, *Rosa canina* ; their second names are termed the specific names.

*E.* I think we shall have plenty of pears this year ; the tree is full of blossoms, some of them quite formed.

*M.* All the varieties of our apples and pears belong to two species only of *Pyrus*. The wild apple, or crab-tree, *Pyrus malus*, is the original from which all our delicious apples have been produced.

*E.* I never could have thought that ; the fruit is so acid and disagreeable.

*M.* You see what cultivation can produce in nature. The juice of the wild fruit is so sour, that it is called verjuice ; but when cultivated and fermented, cider is made from it.

*E.* What is the difference between cider and perry ?

*M.* Perry is the juice of the pear. The wood of the pear tree is light and smooth, and is much used for making picture frames. When stained black, a great deal of carved work is made from the wood of the pear tree, *Pyrus communis*.

*E.* And are our beautiful Orleans plums, too, all taken from those that grow wild ?

*M.* Yes, the cherry, plum, and apricot are different species of the genus *Prunus*. The apricot was, originally, a native of Armenia, and was brought to this country about 270 years ago.

*E.* There is a sloe tree, mamma, at the bottom of our field ; it looked so beautiful a few weeks ago, covered with white blossoms.

I laughed at Charles, because he called it black-thorn. It did not answer to its name then ; I suppose it will before the summer is over.

*M.* I will tell you what William Howitt says about it :—

“ All other trees are wont to wear,  
First leaves, then flowers, then last  
Their burden of rich fruit to bear,  
When summer's pride is past ;  
But thou, so prompt thy flowers to show,  
Bear'st but the harsh, unwelcome sloe.”

Still it is not all mere show with this gay little shrub, for the wood is often used by the turner, for the teeth of haymakers' rakes, walking sticks, handles of whips, etc. I am sorry to say the leaves have sometimes tempted the grocer to mix them with tea, the leaves of which they much resemble in shape, size, and flavour ; I mean our black tea.

*E.* Of all the fruit in the garden I like raspberries and strawberries the best. We have plenty of strawberries now, mamma ; do they come from those little tiny things I found in the wood some time ago ?

*M.* Yes, indeed, they are the same species, but the fruit is enlarged by cultivation and richness of soil. The wild raspberry is found plentifully in the north of Scotland, England, and Wales, and is only smaller than those cultivated in our gardens, from the soil not being so rich. The fresh leaves are the

favourite food of kids; so you see, the raspberry is a species of bramble, by the industry of man rendered serviceable and delicious.

*E.* Well, I never could have thought it had been a species of that troublesome prickly thing that is always catching my frock. I do not care for its blackberries, which the boys are so fond of; I would rather be without them.

*M.* Yet its flowers are not inelegant; and its rich blackberries, on a fine autumn day, often form a beautiful contrast with the bright crimson and scarlet beside them. We have many other species of bramble, similar to the blackberry. The cloud-berry, which has its name from growing on the tops of high mountains, in England, and Scotland, and in many parts of the north of Europe, is one of these. The Norwegians pack up the berries in wooden vessels, and send them to Stockholm, where they are sold for dessert; and the Laplanders bury them under the snow, to preserve them from one year to another.

*E.* My cousin says she went the other day to lady Burford's, and saw some beautiful plants in the green-house. There was one called *Cactus speciosissimus*, I think she called it. She said there were several others, not quite so beautiful as that. The flowers were beautiful, but they had no leaves, and the stems were very ugly, quite distorted, she said.

*M.* I know the flowers you mean. There are several kinds of cactus, and they are all in the same class we have been speaking of, with



*Cactus Speciosissimus.*

the fruit trees and roses ; you know the name.

*E.* The 12th class, Icosandria ; numerous stamens, all fixed to the calyx.

*M.* The roots of the cactus are so penetrating, that they insinuate themselves into the interstices of rocks, where they grow most luxuriantly, though apparently without support. Did your cousin see the *Cactus grandiflorus*, or night-flowering cereus ? It bears a flower



nearly a foot in diameter, of the most beautifully blended white and yellow, and of delicious fragrance. It expands about eight in the evening, but is withered and decayed in six hours afterwards.

*E.* She did not tell me about that; but she saw some very brilliant geraniums, and a passion-flower; not all white and blue inside; but, I think she said, of a scarlet colour: and she has been asking me in what class geraniums are, and I could not tell her. I do not think you ever told me.

*M.* Yes, I have told you; and you gathered some wild geraniums in our walk through Lonesome-wood, a short time since; but it is a class you have not learned: it is the 16th class, called Monodelphia, having stamens united together into one bundle. Gather that piece by the window, and see if they are not so.

*E.* Yes; here they all are, in the middle of this white geranium. In what class can the passion-flower be?

*M.* In the same class with the geranium. The tamarind tree is one of the most beautiful of the plants in this class; its leaves are of a fine green, the calyx and corolla yellow, the pods hairy and brown, the whole tree noble in size, and widely spreading out its numerous branches.

*E.* How I should like to see one growing!

*M.* Tamarinds may be easily grown in a room; it being only necessary, first, to raise

them in a hot-bed ; and that, you know, old John will do for you. The seeds, as found in the preserved fruit, will easily germinate, if not too old. The plant will live through the summer ; and will not only be an elegant plant in the room, but one which will be seen to close its petals every night, and unfold them in the morning, illustrating, in an obvious manner, the sleep of plants, of which we were talking some time since.

*E.* I should like so much to raise a little tamarind plant ; you know I did once raise a myrtle ; and now it is quite a strong, healthy plant. The gardener says it will come into bloom this summer. I think the myrtle is in the class Icosandria.

*M.* Yes, it is ; and it is a native of Asia, Africa, and the southern parts of Europe. Lord Anson mentions, in his Voyage round the World, that the largest trees that could be procured for timber on the island of Juan Fernandez, and from which he obtained beams of forty feet in length, were of this genus.

*E.* I think we shall have plenty of peaches, and nectarines too, for the trees are quite full. I could tell my cousin in what class they are, but I do not know where they grow wild. Not in this country, do they ?

*M.* The native country of the peach is not known ; but it is supposed, originally, to have come from Persia. There are two varieties, the peach with a downy and the nectarine

with a smooth surface ; they are both in the order Monogynia. Of this class, the almond tree, another species, is a native of Barbary.

*E.* Then the potentilla, I saw in that cottage garden the other day, is in this class, is it not, mamma? I tried for a long while, comparing it in my mind with all the other classes, and at last I found it answered to this better than any.

*M.* Yes, you are quite right. I am glad you begin to examine and find out the class to which flowers belong, by yourself. The potentilla, in its wild state, is very different, in appearance, from the beautiful one you saw in the garden. There are several kinds ; it is sometimes called cinque-foil, sometimes silver-weed. You may easily find a wild specimen, by the road-side, with a creeping stem, and solitary yellow flower. There is the hoary cinque-foil, or *Potentilla argentea*—stem upright, flowers in yellow clusters, very common around London ; there is the common creeping cinque-foil ; and last, there is the strawberry-leaved cinque-foil, so much like the wood strawberry, that you could scarcely tell one from the other ; only, in this plant, the fruit does not become fleshy ; by this the strawberries are always known from the cinque-foils or potentils. The next time we go through Lonesome-wood you can look for some.

*E.* My cousin says she is going to begin to study mineralogy. I am sure I should not

like that at all. The study of stones ! how very uninteresting !

*M.* Indeed, I do not think with you. The works of the Lord are great, and ought to excite our wonder, gratitude, and delight ; whether we contemplate those on the surface of the earth, by which we are surrounded ; or explore those hidden beneath, in its bowels ; or view the order and harmony of the planetary systems above us. But remember, they must be sought out of all them that take pleasure therein. To the careless and superficial observer they will yield neither advantage nor pleasure.

*E.* Oh yes, mamma, pleasure they will.

*M.* The pleasure will be very fleeting, too fleeting to deserve the name, in comparison with that enjoyed by the diligent investigator. You must discipline your mind, my dear child, that as you advance in life you may be able to take an attentive survey, as far as your limited powers extend, of the works of God. "The vegetable, the animal, and the planetary constitute that knowledge which God has appointed for us whilst in this world. Beyond these we cannot go, but we must furnish our minds from this large and diversified provision, whilst we reside here. If permitted, through the Redeemer's merits, to enter hereafter on a world where sin is for ever excluded, new scenes will, no doubt, display new proofs of God's wisdom, power, and goodness, adapted

to our new perceptions of sensation, thought, and feeling.”\*—I will put down for you a few rules from a work I have lately been much pleased with, and which, perhaps, you may read some years hence. You are not too young to understand these few rules now:—

I. Endeavour to gain the habit of steady attention.

II. The control of your thoughts.

III. The cultivation of an active, inquiring state of mind.

IV. A careful selection of the subjects to which the mind should be directed.

V. A due regulation of the imagination.

VI. The cultivation of a correct judgment.

If you do not understand all of these now, you will in a little time hence

\* Sharon Turner on the Creation.

## CHAPTER XIII.

*Mamma.* Well, Emily; are you disposed to ascend the remaining steps of your botanical ladder? We have proceeded as far as the 12th class, and I think you are pretty well acquainted with these; so that, on applying your rule, and dissecting any wild flower, you could discover to which of the classes you have learned it belongs. But there are a great many more. The mosses, with which you were so delighted, are in the 24th class, Cryptogamia; and of the intermediate classes you know nothing, except the 13th, Polyandria, of which we have spoken a little.

*Emily.* Oh yes, dear mamma; I should like very much to go on, and I am not afraid of the hard words now. But I cannot think of anything to-day; I feel so dull, just as though I had lost something, now that my cousin has gone. I have tried five times to learn my French lesson, and I say the same words over and over again, without recollecting them.

*M.* I think you had better give up the attempt for the present; a walk in the fields may prove more beneficial, both to mind and

body, just now. I hope you will be able to resume your studies with more success when we return. We must not let our happiness depend on this or that friend. However excellent they may be, or deservedly dear to us, they are but human props, which we should gratefully accept as lent us for a season by our heavenly Parent. But our sources of happiness must arise from God himself, independently of all creature good. His love, as manifested to us poor sinners in Christ Jesus, must be to us a constant fountain of happiness, springing up in our hearts here by his grace, and issuing in the Saviour's purchased possession for his people, everlasting life; so that, if God places you in a society agreeable to your fancy, or in one that is not—if you do but endeavour to keep up a right disposition, and behave accordingly, nothing ought to make you melancholy and unhappy.

*E.* Indeed, mamma, I cannot help sometimes feeling very sad, and sometimes cross too.

*M.* You forget that your feelings, though good servants, are bad masters: you also forget our Saviour's words, "Except a man take up his cross and follow me, he cannot be my disciple." The apostle enjoins us to present ourselves as living sacrifices to God. Now these texts imply, not the indulgence of corrupt nature, but its mortification—a daily, constant struggle with the man of sin within. Do, my dear little girl, endeavour to have



these thoughts and desires more impressed upon your mind, that you may continually grow in grace, and in the knowledge and love of God.

*E.* I will, dear mamma ; but the sun has such power ; I wish we might take a shady walk.

*M.* We will go through Rock's woods, and come home by the paper mills.

*E.* I have found such a beautiful flower ; I think it is called the fox-glove. How tall and straight it grows, full of beautiful purple blossoms, bending down like bells !

*M.* Yes ; it is the common fox-glove, *Digitalis purpurea* : it is a poisonous plant, though very useful in medicine. Sit down on the bank, and see if you can discover to what class it belongs.

*E.* Four stamens, two long and two short. You once told me that class, but I have forgotten the name.

*M.* Class the 14th, Didynamia. It has two orders—Gymnospermia, with the seeds naked ; Angiospermia, with the seeds in a capsule. Tell me, if you can, to which of these your flower belongs.

*E.* Capsule ! I do not remember what part of a plant that is.

*M.* It is the seed-vessel. I once showed it to you in the poppy. Mr. Thornton, who has written on the Elements of Botany, says—“ Flowers, though apparently so diversified, con-



sist but of eight parts ;” and of these we have before spoken, so that I need not explain them again. I will just name them :—the pistil, the stamen, the corolla, the calyx, the nectary, the pericarp, the seeds, the receptacle. But there are many other botanical terms which you will learn by degrees.

*E.* The fox-glove must be in the order Angiospermia, for I see that the seeds are covered.

*M.* A capsule is a seed-vessel ; so also is the pericarp ; but there is a slight difference between them : we will leave that for the present ; some day I will show you the difference.

*E.* You have no occasion to explain to me the calyx, stamens, and pistil ; see, I can show you them in this fox-glove. This pretty green part, at the top, is the calyx ; here are the stamens, two above and two below ; and here is the pistil.

*M.* I am glad you can define the parts so well. They are not, in every plant, so clearly discernible. The first order of this class contains the mints, lavender, hyssop, thyme, horehound—all aromatic and harmless. In the second order we have, besides the fox-glove, snap-dragon, toad-flax, etc., the beautiful gloxinias, the acanthus, and the musk-plant : some of these I hope to show you in Mr. M.’s conservatory. There are but few trees in this class, and none of them are natives of

this country. I had almost forgotten to mention your favourite, the bignonia, or trumpet-flower, which also belongs to the second order of this class.



Bignonia.

*E.* Is the peppermint old Godfrey sells at the end of the village made from the mint in this class ?

*M.* Yes ; and I will tell you how it is prepared. The plants are soaked in water for about a week, which softens the skins of the leaves, and the little bags which contain the oil. They are then put into a still, with water ; and this being heated, the steam rises, and

carries with it the oil of the plants. The steam is then condensed by passing through a cold copper or leaden vessel ; (I will show you how steam is condensed the next time the urn comes in at tea-time ;) and thus the oil, which passes over with the water, settles, and is taken care of. In the same manner other vegetable oils are made, as oil of lavender. A tea-spoonful, added to a pint of spirits of wine and water, makes very excellent lavender-water. Peppermint drops are made by adding the same quantity to a pound of melted lump sugar, and then cutting it into proper shapes.

*E.* I should like to make some of these things. Are there many kinds of mint ?

*M.* Yes ; there are several kinds of mint, as bergamot, sharp-leaved mint, corn-mint, penny-royal, and a few others.

*E.* Only see, mamma ! here is another fox-glove, white : I hardly know which I like best—the white or the purple ; the white is so delicate, and I can put it on my finger, just like a thimble.

*M.* That is the origin of its Latin name.

*E.* I thought I heard some poor children, when I was at my aunt's at Saffron Walden, call them blobs. They used to close up the mouth of the flower, and then knock the other part, and it burst with a noise just like the word blob.

*M.* Yes, I remember they did ; but they have a similar name to the Latin one in

meaning—thimble—in France, Holland, and Germany. Though the plant is poisonous, it is sometimes valuable in medicine. Dr. Withering first discovered its medicinal uses.

*E.* Who was Dr. Withering, mamma?

*M.* He was a very celebrated botanist, whose works may be very useful to you when you are more advanced.

*E.* How happy those little children look on yonder bank! I wonder what they can be doing! Oh! I see; they are making chains of buttercups and daisies.

*M.* Yes; happiness is a very common plant, a native of every place: yet some skill is required in gathering it, as well as your botanical specimens, for many hurtful weeds resemble it; and to mistake these for the genuine plant of heavenly growth, will be of more serious consequence to your welfare than a mistake in your herbarium.

*E.* Oh, mamma, I do hope I shall not mistake! I know you mean that some things which people think will make them happy never can do so.

*M.* Just so; and that you may not fall into the same error, you must seek the teaching of God's Holy Spirit, by prayer, and by the daily perusal of his word, in which he tells us that our Saviour came into the world that we "might have life, and that we might have it more abundantly." Now you know how precious life is to the meanest insect, to the brute

creation, and to the animal nature of man. But our Saviour came that we might have a life superior to all these ; a spiritual, an eternal life. Here you cannot estimate its value ; but enough is revealed in Scripture to make you fear lest the god of this world should blind your eyes to that pure light which our Saviour came to impart. He warned us, too, that we all, by nature, love the darkness rather than light, because our deeds are evil.

*E.* Yes, mamma, I know that, for I feel sometimes many evil thoughts and tempers rise within ; but indeed I will pray that I may be able to strive against them. And now, will you allow me to ask—What can these little pink flowers be that smell so sweetly ? I can never tell the class they are in, they are so very tiny. What can they be ?

*M.* You cannot, then, say you “know a bank where the wild thyme blows.”

*E.* Oh ! is it thyme ? My cousin showed me, the other day, a very pretty little needle-book, made of card, with a sprig of thyme painted on one side and a bee hovering over it. But I do not think the flower was much like this.

*M.* Most likely it was not painted from nature. If you will consent to take your copies from nature, you shall commence flower-painting as soon as you please. This little plant is in the class *Didynamia*. You see it is of one petal, calyx two-lipped. In this

respect many of the plants in this class strongly resemble each other. Not in this country alone, but throughout Europe, thyme is found, and on the Alps and Apennines. Mr. B. said he saw a great deal of it in Italy and Sicily. It is found, I believe, too, on barren mountains in Greece and Turkey. The Athenians considered it emblematic of grace and elegance.

*E.* Every time we come through this field the cows and sheep are always eating. I wonder there is any grass left for them to nibble.

*M.* You need not do that; for the more the leaves are consumed, the more the roots increase. Here we see the goodness of God. The delightful verdure that covers the earth affords nourishment to an almost infinite number of animals; and what increases our astonishment is, that although the grasses constitute the principal food of herbivorous animals, yet whilst they are left at liberty in the pasture, they leave untouched the culm that supports the flowers, that the seeds may ripen and sow themselves.

*E.* Why, mamma, that seems to me just as if they had reason.

*M.* No, indeed; man alone possesses that superior faculty, which renders him a responsible being. Animals act by stated laws, implanted in their nature; insensible of good or evil, they are impelled to the performance of that which is necessary to their own preservation.

*E.* But, mamma, how can it be? Some creatures seem to have much more intelligence than others. Only think of our dog Tido, who fetched Charles's gloves, even though I hid them, the other day, under the carpet. He snuffed about, and then wagged his tail and looked so pleased when he had found them.

*M.* As I have before told you, instinct is capable of being improved by culture. Man may call forth and improve the powers of the brute creation, but he cannot impart to them his own prerogative—reason, a faculty they do not possess. It is probable that different degrees of intelligence, enabling the animal to deviate from its regular instinct, according to circumstances, are enjoyed by every class of living creatures. We find that many birds, which build their nests in the usual form in our climate, when found in tropical countries, where monkeys abound, change their habits, and form hanging nests, shaped like a purse, fixed to the end of a tender branch, where those mischievous creatures cannot reach them. But here we are at the garden gate. I hope you will be able to resume your studies with fresh vigour: we shall meet at dinner.



## CHAPTER XIV.

*Emily.* What can Charles mean, mamma? He says, "Ah! Run-away Jack! I have caught him now, and fastened him up by the greenhouse: he shall not again go clambering over our garden wall." I do not think he can have fastened any boy up; and yet I am sure he would not tell an untruth, even in play.

*Mamma.* Indeed I cannot tell what he means; let us go and see; and if we find any poor little culprit, we will give him his liberty.

*E.* See, mamma! there is no boy here. Well, I am glad of that.

*M.* I think, however, I perceive Run-away Jack.

*E.* What do you mean?

*M.* Gill-go-on-the-ground and Run-away Jack are two of the common country names for ground ivy; and you see your brother has been very carefully tacking it up, so that its pretty heart-shaped leaves form quite an ornamental drapery. Let us examine one of its flowers. You see it is in the class *Didynamia*, a word derived from two Greek words—*dis*, meaning twice; and *dunamis*, power. It is in



the first order, *Gymnospermia*—from the Greek also—*gumnos*, naked ; and *sperma*, seed. You should notice its two-lipped, gaping flowers. You should ask your brother the meaning of *labium* and *ringent*.

*E.* I did, mamma, the other day. When I found that this class contains the labiate flowers, I did not know exactly what it meant ; and he told me that *labium* was the Latin for lip, and *ringent* from, *ringere*, to gape, just as this flower does here. Are the four stamens two long and two short ? Oh dear, how bitter the taste is !

*M.* For that reason it is very often boiled or steeped in ale, to which it gives a pleasant aromatic flavour : it is often called alehoof, or alehave. The active principle of *Digitalis purpurea*, which you know is in the 2nd order of this class, is, as I have already told you, very poisonous. One grain, dissolved in a little water, killed a rabbit in a very short time. *Digitalis* is often employed as a medicine. It has the power of reducing, in a remarkable degree, the action of the heart ; and thus, you see, may greatly relieve many a sufferer.

*E.* So it may ; but, mamma, only look at these nasty nettles ! They ought not to be here ; I suppose they have crept in from the field.

*M.* Oh, I do not object to them on this bank, which can scarcely be said to belong to the flower-garden. See what a number of bees are collected round the tube of the flower. White dead-nettle is a great favourite with

them, from the quantity of honey it contains ; and red dead-nettle I do not dislike, because it visits us in early spring, when flowers are scarce.

“So let them be, despise them not ;  
For, with their homely smile,  
They brighten many a barren spot—  
Perchance some cares beguile.”

*E.* I will not despise them, dear mamma, since you like them ; and now I remember, you told me the stinging-nettle was by no means useless : its leaves are used as a pot-herb, and its stalks are used in making cordage. ✓

*M.* We ought not to disregard any of God's works, since we may be assured Infinite wisdom and Almighty love have made nothing in vain. There is nothing in the universe of which man can dare to assert he has discovered all its uses. Mosses and ferns are deemed by the inconsiderate mind insignificant, and of little use ; but, as you already know, many of them are applied to very valuable purposes. As they flourish most in winter, they shelter and preserve the seeds, roots, and embryo plants of many vegetables, which would otherwise perish ; they furnish materials for birds to build with ; they afford a warm retreat for some quadrupeds, and for numberless insects, many of them growing on rocks and barren places. On rotting away, they afford the first principles of vegetation to other plants. Others grow in bogs and marshes, and, by continual increase and de

cay, convert them into fertile pasture, or into peat-bogs. I suppose you know in what class nettles are?



Class the 14th; Didynamia.  
The white Dead-nettle.

*E.* Oh yes, in the class Didynamia, and the 1st order; the gaping mouths tell me that: but, mamma, you say every flower, even every weed, is useful for some purpose. What can be the use of the dandelion?

*M.* It is both useful and beautiful too, in my opinion: it is eaten instead of endive by the French, as a salad; and have you never observed what a correct dial it is, closing at five in the afternoon, and opening at seven in the morning? Your friend Howitt says—

“Dandelion, with globe of down,  
The school-boy’s clock in every town,  
Which the truant puffs amain  
To conjure lost hours back again.”

*E.* Ah, mamma! I often wish I could do that.

*M.* Since you cannot, you had better follow Dr. Young’s advice, and “pay no moment but in purchase of its worth.”

*E.* I cannot think what is the meaning of

compound flowers ; I heard you say the other day, the daisy was one, and the dandelion and thistle.

*M.* Yes, and several others. I will tell you, and then I hope you will know what a compound flower is. It is the union of several lesser flowers within a common calyx. Each must possess five stamens, their filaments divided, but their anthers united into a cylinder, through which passes the style of a pistil much longer than the stamens, and having a stigma divided into two parts, which rolls backwards. With the magnifying glass you may examine one.

*E.* Here, mamma, is one of your favourites, a double wall-flower : how rich the colours are ! from deep yellow to I do not know how many shades of dark orange : the flower looks almost too heavy for the stalk ; but I cannot find any stamens.

*M.* No ; you will not find any stamens in double flowers : in them they are changed into petals. Gather a piece of single wall-flower from the other side of the garden, and examine that.

*E.* I see it has four long and two short stamens, and four petals placed like a cross.

*M.* Yes ; these are fastened to the receptacle within the calyx. The class is called *Tetradynamia*, from the Greek words—*tessares*, four ; and *dunamis*, power. Plants of this class are many of them very valuable in medicine, from assisting digestion and purifying the blood.

They lose most of their virtues by drying : their taste is acrid. Horse-radish, growing near water, is so acrid that it can hardly be used ; and the turnip, whose root, in a dry sandy soil, is so succulent and sweet, in wet, stiff lands is hard and acrimonious.

*E.* This class, then, has just the same number of stamens as the class Hexandria, which I learned some time ago.

*M.* Yes ; just the same in number, but in this class they are unequal in length ; as, however, this is not always very obvious, you must remember that all the flowers in the class Tetradynamia have four petals ; and this, you know, is not the case in the class Hexandria.

*E.* How curious these little pods are !

*M.* They are the seed-vessels, and determine to which order in the class the plant belongs. The long pod you hold in your hand determines the wall-flower to be in the second order, Siliquosa—from *siliqua*, a long pod. The first order is Siliculosa, a round pod, from *silicula*, a little pod. There have been discovered about 900 different species belonging to the cruciform tribe : most of these grow in the temperate regions of the globe. England produces 70. Most of them you know : mustard and cress, cabbage, turnip-radish, etc.

*E.* Let me tell you some :—Wall-flower, stock, candytuft, and oh ! mamma, that pretty

flower which is so scentless all day, but smells so sweetly in the evening—I always thought it was called rocket, but my cousin says some people call it dame's-violet.

*M.* We will, if you like, take a turn in the kitchen-garden, for there we shall find several plants belonging to our present class, *Tetradynamia*.

*E.* And there perhaps, mamma, I may find some ripe strawberries for you and papa after dinner.

*M.* You may gather some. Although the strawberry is a pulpy fruit, yet, as the specks which contain the seeds are nuts, it is reckoned of the filbert tribe. Removed out of its envelope, the pericarp is a nut, as well as the stone of the cherry, plum, and others. An acorn, without its cup, is a capsule ; so is also the core of the apple. It is not merely the structure of the pericarp, but the circumstances of its growth, and the nature of its envelopes, which must be considered. A capsule, you know, is a thin case containing many seeds, either suffering the seeds to escape by pores, as in the poppy ; or splitting into valves, as in the lily, etc.

*E.* Thank you, mamma, for explaining this : you told me you would some days ago.

*M.* The obvious purpose of seed-vessels is to contain and defend the seeds during the progress of their growth. Many of the contrivances are wonderful, and impress us with

the wisdom and goodness of the supreme Artist, who is concealed behind the curtain. Touch but the ripened capsule of the balsam, and it will recoil at your freedom, and disperse its seed to a considerable distance. The geranium is another instance: here each seed is attached to a spring, which jerks it far off. The cyclamen is still more curious: the stalk of the capsule twists up, like a spring, until the seed touches the ground. One species of trefoil sows its own seed. The various orders of the flowerless or cryptogamic plants are full of these singular contrivances. The mosses, you know, are among these last.

*E.* Yes; I shall not soon forget that hard name, now I have once got it. But, mamma, will you not eat some of these nice strawberries? They are quite ripe.

*M.* Yes; and that you may not mistake, before we begin to talk of the plants in the kitchen-garden, which are in the class Tetrady-namia, you shall tell me in what class this nice fruit is.

*E.* Oh, I know—Icosandria! the 12th class. How beautifully these nice cauliflowers are coming on, and my favourite, sea-kale!

*M.* They are both varieties of the cabbage, which you know is in the 15th class, Tetradynamia. Sea cabbage, in its wild state, is somewhat rare, being found



Class the 15th ;  
Tetradynamia.  
The interior of  
the *Cardamine*  
*pratensis*, or  
Cuckoo-flower.



only near the sea ; but in the garden it is common enough. Various sorts of cabbage are known from each other chiefly by their leaves. There is another kind, growing in corn-fields, called cabbage-turnip, cultivated for the sake of its seeds, from which a valuable oil is produced, called rape-oil, applied to a variety of purposes : what remains, after the oil has been expressed, affords a useful food for cattle. The turnip which you so often see at table, is but another species of the cabbage, distinguished by the root and the roughness of the leaves.

*E.* Do you not remember, in the spring, we sowed some white mustard with cress, for a salad ? My cousin says she has often raised it in the room, by covering a glass bottle with flannel, and wetting it, and then rubbing mustard and cress seed upon it. That is not the same as the mustard I see at table, is it ?

*M.* No ; the seeds of that are black : its pods are much smaller, and quite smooth.

*E.* Here, I see, John has put plenty of horse-radish, but it is not in flower yet.

*M.* *Cochlearia armoracia* will grow even from a small bit of the root being left in the ground. It has numerous branches of small white flowers, which produce many-seeded pods : sometimes it is called scurvy-grass. But our hour in the garden has long since elapsed : our pleasures must not infringe on our duties.



*E.* No ; but do you see these lilies of the valley, just underneath this shady tree ?

*M.* They are beautiful indeed. This lovely little plant once grew in our woods and valleys, but the state of cultivation of the country in general has rendered the plant rare in its natural state. I have read that in the year 1597 it grew abundantly on Hampstead Heath. It is indigenous in most parts of Europe, from Italy to Lapland. In the woods of Eileriede, in the neighbourhood of Hanover, the ground is covered with them. These woods are visited every Whit-Monday, by numerous parties from Hanover, who gather these May-flowers. Our gardens now possess several varieties of the lily of the valley. There is the white, with double flowers ; single and double red ; and a kind brought from Paris, with larger corollas, variegated with purple.

*E.* Red lilies of the valley, mamma ! I never heard of them before ; and I am almost sorry to hear about them now.

*M.* The name lily has been very improperly given to this species of *Convallaria*, as it has not the least affinity with the lily, either in its root, fruit, or flower. I agree with you that we attach an idea of delicacy to this little graceful flower that does not belong to the rest of the tribe. The name *Convallaria* is derived from *convallis*, a valley. The autumn is the proper season for placing these perennial fibrous roots in the ground, when

they should be covered with about two inches of earth, and not disturbed oftener than every third or fourth year, as they seldom flower strong or plentifully after being removed.

*E.* Do you think I could have some lilies of the valley planted in my little garden?

*M.* You may try, but I should fear the mould there would be too rich for them; they flourish best in a loose sandy soil, that is rather poor than otherwise; they flower better, too, in a northern aspect, than when exposed to the noon-day sun. Geraniums, I think, will thrive in your little garden; and you may ask old John to place some there for you. They are, you remember, in the 16th class, *Monodelphia*, from the Greek words—*monos*, alone; and *adelphos*, a brother: the stamens you will find all collected and united together into one bundle.

*E.* Yes, I remember examining a piece. When I went out with Miss Eldon, I was quite tired of doing nothing; so as we each had bouquets of flowers, I pulled one to pieces, to find out in what class it was. I was quite disappointed that day: I had expected so much pleasure, and I came home quite tired, and I could not sleep at night; all the fine things I had seen came before my eyes: and the next day I was quite wearied.

*M.* That is often the result of pleasure—I mean of that pleasure which manifests itself in

extravagant gaiety and exuberant spirits. Happiness retires to its own proper region—the heart, and may every day be our inmate, if we do not chase it from us by evil tempers and unsubdued desires. Fenelon says it is an enemy to pomp and noise, and so I think you will find it: but did you not enjoy the music?

*E.* Oh, yes, dear mamma; and thought how much I should like to play as well as some of the people I heard there. Miss Eldon says, she practises four hours every day; is not that a great deal of time?

*M.* It is, indeed, far too much time, I think, to devote to the acquisition of a mere accomplishment, in which, after all, the songsters of the grove will rival her.

*E.* Oh, yes; and I have heard you and papa say, you thought there was no music like the music of nature.

*M.* No; to me—

There's music in the wind's low sigh,  
Gently stirring the trees as he passes by;  
There's music in the bird's wild lay,  
As he carols aloft at break of day;  
There's music, too, in the hum of the bee,  
As he gaily sports o'er blossom and tree;  
There's music in the summer's gale,  
As it fans the flowers in yonder vale;  
There's music, and beauty, and joy to me;  
For these, my God, all speak loudly of thee.

*E.* Some of the ladies had camellias in their hair, and I thought they were artificial flowers;

but Miss Eldon said they were real, and that they would last very well for an evening.

*M.* They are beautiful flowers, and look very well in the hair. Plants of the most elegant structure and vivid colours are in the class Monodelphia. No plant of poisonous qualities belongs to it. The valuable cotton-tree, the tea-tree, the delicious tamarind, and that largest production of nature, the baobab, or monkey bread of Africa, all belong to this class, which, however, is not an extensive one. There are but twenty-two British plants in it.

*E.* What a very odd name, mamma, monkey bread-fruit!

*M.* The origin of the name of some plants is very curious and entertaining. I do not exactly know the origin of this; but did you ever hear why your favourite, forget-me-not, which you know is in the 5th class, is so called?

*E.* No, indeed; and if it is a story, I should like to hear it.

*M.* Well then, it is said that a young lady was one day walking with a friend on the banks of the Danube, when she saw a bunch of these elegant little flowers growing in the stream; wishing for them, the gentleman reached the longed-for flowers, and in doing so fell into the river. He struggled long, but was unable to stem the current; making, however, one last effort, he threw the flower to the lady, exclaiming, "Forget me not!" Since this time

the plant has been the emblem of memory all over Europe.

*E.* I think the lady must have been very sorry that she wanted the flower. Do you think it is a true story?

*M.* Indeed I cannot tell; such is the tale. The origin of the names of some other plants is very amusing, and on a better foundation than this. But as you are fond of a story, I thought I would indulge you: now go to your lessons; and, if the evening proves fine, we will enjoy a walk through the corn-fields.

## CHAPTER XV.

*Emily.* What beautiful mallows! I have been dissecting one, and think they must be in the class Monodelphia, for here are the stamens united together in one bundle, and so they are in this meadow geranium.



Class the 16th; Monodelphia. Meadow Geranium.

*Mamma.* You are quite right; and that beautiful white hollyhock yonder, in that garden, is in the same class—Monodelphia.

*E.* Now we have come to the corn-field! I always enjoy this walk. The blades will soon be as tall as I am: I wonder how people first came to think of making bread of corn!

*M.* It was some time before they attained the art of making bread. Most nations were originally savages, such as you heard me reading about a few evenings since in Mr. Williams's interesting narrative of the South Sea islanders. In that state every man thought only of providing for himself.

*E.* Then, I suppose, they were very selfish.

*M.* Indeed they were, and cruel too, before agriculture and other useful arts were under-

stood, and without the word of God, which can alone enlighten the mind. The difficulty of obtaining food was very great. Hunting was their principal employment; but as men increased, animals became scarce and shy; at last they thought of taming some of the most useful, and so men gradually changed from the condition of hunters to that of shepherds.

*E.* I am glad of that: I would sooner be a shepherd than a hunter. And used they not to dye their skins blue?

*M.* Yes; the ancient Britons used a plant called woad, which is in the class *Tetradynamia*, for that purpose. Some nations become sooner civilized than others, according to different circumstances. Corn, like the other productions of nature, was found scattered about on the earth in wild profusion. Men tasted these seeds; and, perceiving that they were nice nourishing food, ate very plentifully of them, till they became very scarce. Want taught them to sow the seeds, and, by gradual improvement, to cultivate the ground every season till they obtained regular harvests.

*E.* It was a good thing that at last they learned to do that. I suppose all the people on the earth make their bread of corn.

*M.* No, indeed, they do not. The native Americans eat the root of the cassava, ground to powder, and made into cakes; and the Laplanders grind the bark of trees for their bread. Rice, that valuable plant which grows

in water, and which supplies with nutriment one-third of the human race, forms the principal food of the Chinese, and of many other nations that inhabit warm climates.

*E.* Do you see those dark clouds just behind the wood? I hope there will not be a thunder-storm. I cannot help always being afraid of thunder.

*M.* Fear embitters so much the happiness of yourself, and, by sympathy, that of others, that you should endeavour to overcome one so groundless.

*E.* Ah, mamma, but is it groundless?

*M.* Yes, indeed it is; for the danger is past when the noise is heard. The fall of a thunder-bolt is as quick as lightning: the continuation or rollings of thunder proceed from a kind of echo formed in the air, which may be likewise occasioned by several solid bodies upon the earth, which send back those rollings we hear after a loud clap of thunder.

*E.* Only see, mamma, how it lightens! Do let us stop somewhere.

*M.* Gladly. We will reach Selby's cottage; it is not far from here; but if you do not endeavour to command your feelings, you will deprive yourself of that presence of mind so necessary to possess in circumstances of *real* danger; and I do not think you are in any just now: it is only the electric fluid forcing a passage through thick clouds; the inflammable matter, being thin and light, is in the upper



part of the atmosphere, where it flashes without doing harm.

*E.* But I do not know what electricity is, and that makes me more afraid.

*M.* True ; ignorance is often the cause of fear. Electricity is a very subtle fluid, which pervades every part of nature. When you go home you may try a little experiment. You may rub your doll's amber necklace with flannel, and you will find it attracts bits of paper, that is, will take them up ; sealing-wax will do the same. If a tube of glass, two or three feet in length, and an inch or two in diameter, be rubbed pretty hard in a dark room with a woollen cloth, besides attracting light substances, it will emit flashes of fire, attended with a crackling noise ; this luminous matter is called electricity, or the electric fluid.

*E.* I am glad the dark clouds are rolling away.

*M.* Yes ; and if your fears will be governed by your judgment, I shall be glad to reach home without stopping on our way.

*E.* I am not afraid now, mamma : I mean, I will try not to be.

*M.* Remember, my dear child, the best antidote to fear is a firm trust in that God who has assured us that the very hairs of our head are all numbered. What words could more express his constant care—his tender love ! Remember, also, who uttered those words : He who *gave his life* a ransom for you. Scarcely

for a righteous man, the apostle tells us, will one die ; yet Christ manifested his love towards us whilst we were yet sinners, alienated in heart from him, following the devices and desires of our own corrupt natures, forgetting Him who made us, who has surrounded us with the proofs of his wisdom and tender goodness in all that we behold ; who has given us innumerable instances of his benevolence, and desire to promote our happiness, in the structure of our bodies as well as in the capacities of our minds. Did you ever consider the structure of your hand, in which you are now so easily holding that little flower ? Every finger consists of three bones ; now, if instead of three you had only one in each finger, you could not hold anything as you now do, and thus you would be deprived of one source of pleasure. In your hand are twenty-seven bones altogether.

*E.* So many as that, mamma ! I could not have thought it.

*M.* No, because on these subjects you do not exercise thought at all. I hope, as you grow older, you will ; and thus see more of God's love, wisdom, and power daily : but, remember, the brightest manifestation of it is in the gift of his Son.

*E.* Is not this wood-sorrel ? I gathered it because Charles asked me to get him a piece. I was almost afraid the storm would prevent my looking for any.

*M.* Pray gather some quickly : it is an elegant little plant ; no gay colours, you see, but of a pure white. As soon as night approaches, it closes its petals, folds up its curious triple leaves, and hangs its flowers towards the earth, thus preserving the more tender parts from injury.

*E.* How very pleasant the taste is—such a nice acid !

*M.* It contains a deadly poison, oxalic acid, or salt of sorrel.

*E.* Then, mamma, have I done wrong in eating some ?

*M.* No, not in eating a leaf or two. The least quantity that would poison a child is half a quarter of an ounce of pure oxalic acid ; about twenty handfuls.

*E.* What is that acid used for ?

*M.* It is used in bleaching, cleaning boot-tops, taking out ink-spots, etc.

*E.* In what class is it, for indeed I cannot tell ?

*M.* In the same class with that pretty little pink flower, campion lychnis.

*E.* What, ragged robin ! Ah, I will find you out in the class Decandria, 10 stamens.

*M.* Quite right ; in the same class are the pretty pinks in your garden.

*E.* Look, look, mamma ! I suppose I must not stop to gather them ; but how beautiful those drooping blue flowers are, climbing up that hedge !

*M.* No, we will not stop for anything now. They are in the 17th class, Diadelphia. Did



Class the 17th ; Diadelphia.

you notice those troublesome tares among the wheat? They are in the same class, as also clover, lucern, sainfoin, and others.

*E.* What are those pretty blue pea-shaped flowers called?

*M.* Tufted vetch. It may be doubted if the common vetch be really a native plant, though it is so often cultivated, either alone or with rye-grass, as a green spring food for cattle. There is some white trefoil. See ; the stem is long and creeping, leaflets roundish, generally darker-coloured towards the stalk, and streaked with white across the middle : this is the celebrated shamrock of the Irish. You must gather a piece for your herbarium : its leaf is blended with the rose of England and the thistle of Scotland, to show the union of the three kingdoms.

*E.* Are there many other flowers in this class, besides those you have told me of? I remember the flowers you said were papilionaceous, because they are shaped like a butterfly.

*M.* There are a great many more wild flowers which I shall leave you to find out, as well as the beautiful laburnum, the acacia, the lupin-tree, and others in the garden, with

the sweet pea, of which we have already spoken.

*E.* Yes; and I remember being puzzled about that.

*M.* Because you did not know that the orders of this class depend upon the number of the stamens, which are either 5, 6, 8, or 10 : the last is by far the most common.

*E.* I am glad we are at the garden-gate. How beautiful the drops of rain look on the flowers and leaves ! Only see, sparkling like diamonds.

*M.* Beautiful indeed. You see a thin skin covers every part of the vegetable organs, except the stigma. This membrane is a defence against atmospheric changes, as well as answering several other purposes in the coloured parts of plants, particularly in the leaves ; it is the instrument by which vegetable breathing is carried on.

*E.* Vegetable breathing ! how strange that seems !

*M.* Do you not know that a leaf consists of an outer skin, or membrane ; next, of a pulpy portion, called cellular tissue ; and, within these, of woody vessels or fibres ?

*E.* Dear me ! that is just like our skin, flesh, and bones, then !

*M.* Your comparison is very just ; and, in the same manner as in the animal body, there are veins, vessels, and pores, through which a circulation of fluids is carried on. When you tear off the covering of a leaf, and put it under

a microscope, that which appears to your eye a fine even skin, will be found intersected with vessels which give it the appearance of the most delicate net-work : it is also scattered over with curiously-shaped pores. You will be surprised when I tell you the number of pores on a square inch of some plants.

*E.* I dare say I shall ; but do, if you please, tell me. Oh ! here is a clove pink. How many are there on one leaf here ?

*M.* On a square inch of that delicate leaf, there are on the upper surface 38,500 ; on the under surface the same number : add them together, and tell me how many in all.

*E.* 77,000. And are there as many on all leaves ?

*M.* No ; the number and form of these pores, called *stomata*, vary. On leaves covered with water, none are discoverable ; floating leaves have them only on their upper surface.

*E.* How many do you think there are on this hydrangea ; on this beautiful leaf ?

*M.* *Hydrangea quercifolia*. None on its upper surface, but on its under part, 160,000. The difference of numbers will be found to agree with the rapidity with which the leaves wither after being gathered.

*E.* Oh yes, mamma ; I know the hydrangea fades almost as soon as I have gathered it ; this spider-wort lasts much longer.

*M.* That has 2000 on its upper, and the same number of pores on its under surface.

*E.* See, mamma, how these flowers have revived ! I am sure the rain has not had time to reach their roots.

*M.* No, indeed it has not ; the only absorbents in these cases have been the pores upon the cuticle : these pores enable plants to absorb moisture and gases from the atmosphere, and to throw off such as are useless or hurtful.

*E.* Is not this beautiful tree called a lime ?



The Lime.

*M.* Yes. I must tell you that air and sap vessels exist in every part of a plant which is not cellular tissue. In the pith we find no vessels of any kind, nor yet in the pulp of fruit, where they are not wanted, as the cells are capable



of absorbing moisture and conveying it from one to another.

*E.* What is cellular tissue?

*M.* Pulp, or cellular tissue, consists of a number of bags filled with air, or with various juices: these are chiefly water, occasionally flavoured with certain products, such as bitters and acids.

*E.* Oh yes; I remember how very acid the apples are on that tree at the bottom of the garden.

*M.* Sometimes the water is absent, and oils, gums, resins, starch, sugar, etc., take its place in some, if not in all of the cells. Cotton is cellular tissue in a dried state.

*E.* Do you know, mamma, when I stayed at my cousin's, she showed me such beautiful leaves of plants, with all the green part off! It was quite like lace underneath! I cannot remember what she called them.

*M.* Anatomized leaves, do you mean?

*E.* Oh yes, that was the word. I should very much like to try to do some. Can you tell me how they are done?

*M.* You must immerse in water the leaves selected, which must be of a woody fibrous nature: change the water every month, and suffer the specimens to remain in it till the outer skin of the leaf may be easily separated from the other parts with the thumb and finger.

*E.* And can I get it all off in that way?

*M.* No, I fear you cannot; but the green



parts remaining on the fibres may be easily washed away by holding them singly under the water-cock: the water from it will wash away all but the woody part of your leaf. The specimens will now only require bleaching; to do which, let them remain till white in a diluted solution of chloride of lime, washing them in warm water afterwards. As I know you have not a great deal of patience, you may hasten the process by letting your water be hot at first, which deprives the leaves of their vitality. When cool, add a little sugar and vinegar, which promotes fermentation. You must keep your specimens in a warm place, as by so doing the fermentation is continued, and thus hastens the decomposition. Whenever the water becomes impure, it may be changed, and a little more sugar and vinegar added to the fresh.

*E.* Thank you, mamma; how very much I shall like to do some! Cannot I begin to-day, and take in some leaves with me? Here is an ivy-leaf: will that do to try?

*M.* That will do very nicely, as it is of a woody nature, and not resinous; but you must be very patient, as probably you may not succeed at first; and if you do, it may be two months before you will see the result of your labour.

*E.* Two months! That seems a very long time, mamma.

*M.* The leaves of the holly, apricot, poplar, pear, cherry, orange, and lemon, all take two months before they are completed. Magnolia leaves and St. John's wort form very beautiful specimens, as well as branches of butcher's broom; but that requires three or four months. The winter cherry is exceedingly pretty anatomized, and that only takes one month to complete. The best time to select your specimens is when they are fully matured, and before they begin to decay.



Class the 18th;  
Polyadelphia.

*E.* Here is a piece of St. John's wort. I should like to try this, as you say it is so beautiful, and to put the name and class on a piece of paper underneath; but I cannot tell in what class it is: it looks as though it belonged to the class Icosandria.

*M.* No, indeed, it does not; it is in the 18th class, Polyadelphia. The stamens are united into more than two sets; but unless you examine them quite down to the bottom, you might in some species suppose that they were all distinct, and of course consider the plant as belonging to the 12th class.

*E.* I see what you mean, mamma; the filaments are united at the bottom, just as my camel's hair pencil is. How I long to use those pretty brushes! You know I have been practising drawing flowers for a long while. Before

I dry them for my herbarium, I always try to draw the shape of them.

*M.* I have observed that you do; and, to encourage you, I will allow you to try to colour some simple flower from nature; this heart's-ease, for instance. I should advise you to place a piece of white paper at the back of it; then notice where the shadows fall, and put them lightly in with neutral tint.

*E.* I know how to go on: then the pretty yellow, and the touches of purple in the centre.

*M.* Yes; but be very particular in having your colours clear, and only painting what you see.

*E.* Are there many plants in the 18th class?

*M.* It is by no means an extensive class. The only native plants in it belong to the genus *Hypericum*, the plant you have in your hand. *Hypericum androsæmum* grows naturally in woods and in damp ground under hedges. The beautiful orange and lemon trees in the greenhouse belong to this class. In their native country, the warmer parts of Asia, they grow to the height of twelve and fifteen feet. Those splendid greenhouse plants, the various melaleucas, belong to the second order of this class.

*E.* Only see, mamma, how these dahlias are folded up—not a leaf appearing!

*M.* They will greet us with their splendid colours in due time. Every season has its peculiar beauties: the dahlia, you know, is quite

an autumn flower: there is one of its poor relations; and as he is in the paddock we will not disturb him.

*E.* What, mamma! is the thistle in the same class with the dahlia?

*M.* Yes, indeed; and the humble daisy, and despised dandelion, with pretty golden rod, lavender cotton, groundsel, Michaelmas daisy, everlasting flowers of various kinds, with chamomile, sun-flower, corn-cockle, etc., are all in the 19th class—Syngenesia, having the stamens united together by their anthers: it contains five orders.

*E.* Are they not compound flowers?

*M.* Yes, being made up of small flowers or florets. No poisonous plant is found among them. Most of them are bitter in taste and strengthening in quality. In some plants all these numerous little florets have both stamens and pointals; in others either the stamens are wanting, or the pointals, or both; and from these circumstances the orders are formed. I acknowledge with you, though

“The thistle is here, yet it should not be  
Admitted, I think, in such company.  
So we ’ll pass it by, though its purple globe  
Might outvie the tints of an emperor’s robe.  
It’s armed at all points with a hostile fence,  
Eager to wound for each slight offence,  
Like vulgar pride in its consequence.  
So we ’ll none of the thistle tribe or nation,  
Nor the surly nettle, its near relation,”

in our pretty flower-garden : on the bank, and in the field, we will not disturb them.

*E.* I like those lines. Do I know the person who wrote them ?

*M.* No ; I do not think you are acquainted with Miss Strickland, though you are indebted to her for some amusing stories.

## CHAPTER XVI.

*Emily.* See, mamma, is not this pretty? Ladies' slipper, nurse tells me it is called.

*Mamma.* Gynandria Diandria; Ladies' slipper, or *Cypripedium*.

*E.* What hard words, mamma! what can they mean?



Class the 20th; Gynandria. Specimen, Passion Flower: stamens attached to or growing out of the pistil.

*M.* Gynandria is the 20th class, and in it the stamens are attached to or growing out of the pistil; this class contains flowers, some resembling insects, others reptiles. There is the bee-flower or orchis, and the fly-flower or fly orchis, the spider orchis, the butterfly orchis, and many others.

*E.* Dear me, how very curious! and are any of them growing wild in this country?

*M.* Many of them ornament our meadows and woods. The bee orchis is often seen on the hills in the south of England. To see the flower, you would suppose that three or four bees had settled upon the stem. When I was travelling with your papa last summer, I saw a great many of them; the lower lips of the flower are brown, streaked with yellow, and feel just

like velvet. The formation of the stamens in plants of this description is very curious; the pollen is found sometimes in powdery lumps, as in other plants; but more frequently it resembles little bits of bright yellow wax, two together, stalked, and furnished at the lower end with glands.

*E.* I do not remember ever seeing any flowers of this kind.

*M.* I am sorry to say old John destroyed some bee-flowers and others of this description we brought with us from the country. As they did not flower the first year he supposed them to be dead. It is usually two or three years before they recover themselves after transplantation, and produce flowers. In tropical countries these plants are seen in all their beauty and magnificence.

*E.* I wish I could see them.

*M.* Then you must ask Captain Brown to take you with him when he goes to Brazil or to Sumatra, where they hang upon the branches, or climb from tree to tree, forming flowery garlands without earth to support them, seeming to derive all their nourishment from the air.

*E.* How very strange! where can their roots be?

*M.* They shoot their fibrous roots into the stems and branches to which they cling.

*E.* Did you not tell me that air vessels exist in every part of a plant?

*M.* Yes, in every part which is not cellular tissue. The vessels, from their different forms, are called spiral, reticulated, annular, punctured, and beaded, all of which convey fluids upwards; while there are straight bundles of tubes to convey them downwards, called ducts. Break carefully the leaf stalk of that elder-tree. As we draw the parts asunder, do you not see the spiral vessels like screws partially unroll? These vessels are not equally abundant in every part, nor do they run through the whole substance of the stem; they are not found in the pith, nor are they in the bark, and very rarely in the root.

*E.* You mentioned a great many other kinds of vessels; will you explain them to me?

*M.* The reticulated vessels are found only in old plants; they are situated chiefly in the root in bundles. The annular vessels consist of a number of rings, sometimes united together, sometimes separate, but connected with a fine membrane which forms a tube around them; you may find it in the spider-wort and balsam. The punctured vessel is the largest of all the vessels, and nearest to the bark; it is like a tube covered with oval-shaped dots; it exists in the root, the wood of the stem, and the leaf stalks. The beaded vessel resembles a chain of oblong beads; it is found in the tubercles of the roots and knots of stems; it is by many botanists thought that the beaded, the punctured, and the reticulated vessels, are nothing



more than the simple spiral in a state of partial decay. You should notice these things, and by that means every walk in the garden will have additional pleasures for you.

*E.* I cannot think in what class this alder is; I have been pulling its flowers to pieces, but I cannot find out.

*M.* In the 21st class, Monœcia; stamens and pistils in separate flowers, but growing on



Class the 21st; Monœcia. The Box Tree; pistils in one flower, stamens in another; *a*, a stamen flower; *b*, a pistil flower.

the same plant; in this class and the two following are placed the greater part of the timber trees. The stamen-bearing flowers are mostly in drooping catkins, and the pistil-bearing ones, near, but distinct from them, on the same bough; this is the case with the nut-tree, the alder, the birch, the beech, the horn-beam, and the oak.

*E.* I am glad I know; now I shall try to find them out.

*M.* Their flowers are very insignificant, and make their appearance before the leaves. I forgot to mention the pine or fir; and, besides the trees which I have mentioned, there are the

stinging-nettle and some curious water plants : this class, you see, is not confined alone to timber trees.

*E.* And the bread fruit tree. My uncle has a drawing of it, and I think he said it was in this class.

*M.* You are right ; it is very valuable to the inhabitants of the South Sea Islands ; did you not hear that excellent missionary, Mr. Williams, give an account of it ? It grows to the height of thirty or forty feet, and the fruit is as large as a child's head, hanging on the boughs like apples. The eatable part lies between the skin and the core, and is of the consistence of new bread of a nice sweet taste. It supplies a delicious and wholesome food to the inhabitants for full seven months in the year ; they make cloth of the bark of the tree, and use the wood in building their huts and canoes. There is another species in the East Indies called the Indian jaca-tree. The fruit is said to weigh about thirty pounds, and is used as food, but not so generally as the bread fruit.

*E.* Do the people in the islands of the South Sea eat the bread fruit just as it comes off the tree ?

*M.* No, they first roast it. The cocoa nut, sago, (of which you are so fond,) the plane-tree, the mulberry, the chestnut, the walnut, are all in this class ; it has eight orders ; the bread fruit trees belong to the first ; and in the last are the castor-oil plant and many others.

*E.* I should like to know something about all of them.

*M.* Indeed I cannot tell you them all; you must read and find out for yourself. I will mention a few more to you. The tree which produces Indian rubber is in this class; it oozes from a tree called *Siphonia elastica*, a native of the West Indies.

*E.* I am afraid I shall not remember that hard name.

*M.* Well, I will tell you something of the cypress-tree, which is in the same class. In the island of Candia, where these trees grow in abundance, one of them only is so valuable that it is frequently given as a daughter's portion. The doors of St. Peter's church at Rome were originally made of this timber; and when they were removed at the end of six hundred years, in order to place gates of brass, they did not show the slightest appearance of decay: the coffins in which the Athenians buried their heroes were of cypress wood.

*E.* Thank you, dear mamma; Charles is very fond of talking about heroes. I shall like to tell him about it. I wish there was a mat at this door; I mean a new one, for this old one makes me fall.

*M.* Indeed I do not think it is the fault of the mat, but your careless way of going in. However I should like very much to procure one, such as I saw the other day, made from the cocoa nut.

*E.* How can they make mats from the cocoa nut?

*M.* In their natural state the inner shells are surrounded by a thick crust of coarse fibres, which are employed for making mats.

*E.* What country does the cocoa nut come from?

*M.* It has been introduced into many warm countries, but originally it came from the East Indies. It thrives best in places near the sea side. On the banks of the river Orinoco, in South America, where the cocoa nut is planted, they generally throw a quantity of salt into the hole near it; it grows to the height of sixty feet, crowned at the top with leaves from ten to fifteen feet long; and you may judge of the size of the nuts by the inner shells, which you have often seen.

*E.* You know, mamma, how fond Charles is of puzzling me with questions. The other day he brought me a cluster of hops in flower, and asked me to tell him its class and order.

*M.* That was an unfair demand, since it is in a class with which you are not at all acquainted, the 22nd class, *Dicæcia*; stamens and pistils in separate flowers and also on separate plants. The hop is found in the 5th order of that class. Few ornamental plants are found here; but there are several useful ones: the nutmeg, the yam, the hemp, the spinach, the butcher's broom, and that curious plant of which I once showed you the picture, *Nepenthes distil-*

*latoria*, or pitcher plant. Our own island can boast of seventy species of willow. Some of the poplars, and that emblem of sorrow, the yew-tree, belong to it.

*E.* Which part of the hop does the brewer make use of?

*M.* Of the heads of seeds, their bitter property preserving beer from becoming sour. It is only the flowers with pointals that produce seed, and are useful to the brewer. They are in



Class the 22nd ; Dicoecia. The Yew Tree : *a*, the stamen-bearing blossom ; *b*, the pistil-bearing blossom.

short round heads, or catkins, formed of scales folded over each other. The barren flowers are in large loose bunches, something like the blossom of the lilac. The young shoots and leaves of hops were formerly brought to market and eaten as a spring vegetable. Some persons think that they are very like asparagus in flavour.

*E.* Did you not say the nutmeg-tree was in this class ? Is it a pretty tree, and where does it grow ?

*M.* It is a very beautiful tree, and grows abundantly in the East Indies. The fruit is about the size of a nectarine, and consists of three coats ; the first, a fleshy pulp ; the second, a coloured membrane, which is the spice called mace ; and the third, a shell containing the nutmeg, which is the seed of the plant. The leaves have a very fragrant smell, as well as the fruit.

*E.* Did not Captain Brown once bring you some nutmeg fruit preserved ?

*M.* He did so. In India it is generally introduced at tea, but the pulp and mace only are eaten.

*E.* I am always glad when Captain Brown comes ; he tells such amusing stories.

*M.* Can you tell me anything which he has told you about ?

*E.* Do not you remember, mamma, he told me about the dancing snakes which people in Hindostan carry about in baskets, and when the man played with his flute the snake seemed to keep time with his head ; and that often when people's houses were infested with snakes which ate up their poultry, they would send for these musicians to charm them out of their hiding places, and destroy them ?

*M.* That account seems to have made a deeper impression on your mind than the interesting description he gave us of the *Ficus Indica*, or banian tree.

*E.* Oh no, I have not forgotten that he

said the Hindoos were particularly fond of this tree, and I am sure I should be, for it has many trunks ; and the stems, stooping down to the ground, and taking root, form the most beautiful cool walks. How very much I should like, with Charles and tiny Lucy, to play underneath one !

*M.* Yes, with parrots and monkeys for your companions : but remember there are snakes there too.

*E.* What kind of fruit has it ?

*M.* A small fig ; when ripe, of a bright scarlet ; affording food to monkeys, squirrels, peacocks, and birds of various kinds, which dwell among the branches. The leaves are large, soft, and of a lively green. The tree belongs to the 23rd class, Polygamia. This class has the stamens and pistils separate in some flowers, and united in others, either on the same plant or on two or three separate ones ; it is a small class, containing but one British genus, the orache.

*E.* Is that a pretty flower ? I never remember seeing it.

*M.* You may not know it by name, but I think you must have seen it. It is found on waste places at the end of the summer. It is a straggling weed, with halbert-shaped leaves, and with very small greenish flowers in little bunches.

*E.* And are there not some foreign plants in this class ?



*M.* Yes, indeed; there are many: the sensitive plant, in the green-house, belonging to the mimosa family, is one of them; then we have the beautiful acacias, one species of which yields gum-arabic. The veratrum is not only useful but ornamental; the fan-palm also, which is the only European species. In tropical countries, where palms abound, they yield all the necessities of life—food, drink, raiment, and a thousand other things essential to the comfort of mankind, such as timber, ropes, etc.

*E.* Is not that the leaf of a palm tree we have in the next room?

*M.* Yes, that is a small one. The great fan-palm reaches to the height of 150 feet; each leaf is sometimes twenty feet long. You may judge of the value of the palm, when I have named to you a few of the species. There are the date-palm, the cane and bamboo, the sago-palm, the betel-nut, catechu, the woso-palm, dragons' blood tree, and the cocoa-nut palm.

*E.* Thank you, mamma, for this nice interesting account. Now I think we have got to the 24th class, but I never remember that hard word by which it is called.

*M.* Cryptogamia—a class containing plants which have no flowers: they are divided into the orders of ferns, mosses, hepaticæ, lichens, algæ or sea-weeds, and fungi, of which you know mushrooms are one species. We will



not now enter upon any of these ; but I should like you to tell me to which of the classes belong our timber trees and fruit trees, and to which we are indebted for the principal food of man, corn.

*E.* I think I can tell. Wheat, and nearly all the grasses, belong to Triandria Digynia ; that means 3rd class, 2nd order. Then I know our delicious fruit trees come from the 12th class, Icosandria ; and in the 21st, Monœcia, are found our timber trees.

*M.* Quite right : you will also find that all the plants of the 12th, 15th, and 19th classes may be used as food without danger.

*E.* Do not the 5th, 6th, and 10th classes contain the greatest number of plants ?

*M.* They do ; but why did you not use the proper botanical terms, Pentandria, Hexandria, Decandria. The 19th, Syngenesia, is very numerous. You remember the daisy, with its green cup, its wiry stem, and fringed border, set, as it were, in gold ?

*E.* Remember it, mamma ! who can forget that dear little modest flower ? I think I like it better than all the field flowers ; though ragged-robin is much gayer, and the hare-bell, oh, the hare-bell, is more graceful ; still I love the daisy best. Who is it that says,

“ The rose has but a summer’s reign,  
The daisy never dies.”

*M.* Montgomery. The daisy and buttercup

bring with them our earliest associations of delight; and we may thus account for their being universal favourites. They belong however to very different families, and have very different qualities; the buttercup is in the 13th class, Polyandria; it is of so poisonous a nature that no animal will eat it. No insect is found upon it, not even the bee comes to it for honey. It is not used in medicine, and is put to no purpose in the arts.

*E.* Dear me; I am sorry it is such a worthless thing: Miss Strickland did not think so, when she wrote those pretty lines—

“Welcome, little buttercups;  
Welcome, daisies white;  
Ye are in my spirit  
Visioned, a delight;  
Coming o’er the spring-time,  
Of sunny hours to tell;  
Speaking to our hearts of Him  
Who doeth all things well.”

*M.* Miss Strickland does not advert to their poisonous qualities, but only to the unmingled pleasure their pretty gold cups afford in early youth; and does not all the vegetable world speak loudly to our hearts of “Him who doeth all things well.” The beauty and variety of form and colour; shade melting into shade, each season presenting its appropriate and peculiar attractions: then the curious developments we witness, and the valuable products collected; all formed of the same material, and yet so different, that the chemist in vain

endeavours to explain the cause of their peculiar action. Water and carbon, or charcoal, united by one vegetable, form sugar ; by another, starch, oil, resin, wax, or gum.

*E.* What appears to me most strange, is, that plants live and grow, though they cannot move. They take their food, though they have no mouth ; they breathe, though they have no lungs ; they sleep, though they do not know when it is night.

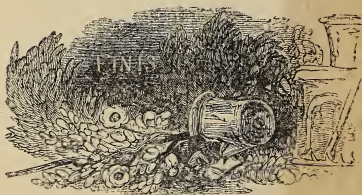
*M.* Yes, and they have a circulation, though they have no heart ; they are benumbed by frost, revived by warmth, are killed by being deprived of nourishment, and grow plethoric by superabundance—are liable to injury, disease, and death, as we are ; and after death are subject to the same decomposition and decay.\* Tell me, then, in what respect you and I are better than a plant.

*E.* Oh, mamma, we can move at pleasure where we like, and we know when we do right or wrong.

*M.* And that knowledge, my dear little girl, renders us responsible beings to the Almighty God, who bestowed on us such various powers of body and mind, and if unimproved will but increase our guilt and misery ; for you must remember that the present life is only the commencement of our existence, the dim dawn, the twilight of our day ; and we should habitually consider how short and how

\* Francis's Grammar of Botany.

uncertain is the time allotted us for the formation of those habits, dispositions, and tastes which must attend us through eternity. When is it you feel real enjoyment? not in those gay scenes which the world presents, but in that better portion which cannot be taken away, which will fill the vast capacities of your immortal soul.







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